

EXHIBIT 31



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Cho et al.

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(54) **PORTABLE COMPUTER AND METHOD FOR MOUNTING A FLAT DISPLAY DEVICE MODULE**

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(58) **Field of Search** 361/679-683; 292/8, 56, 32, 94, 11; 248/917-923; 349/58, 59, 60; 16/342, 307

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Primary Examiner—Darren Schuberg

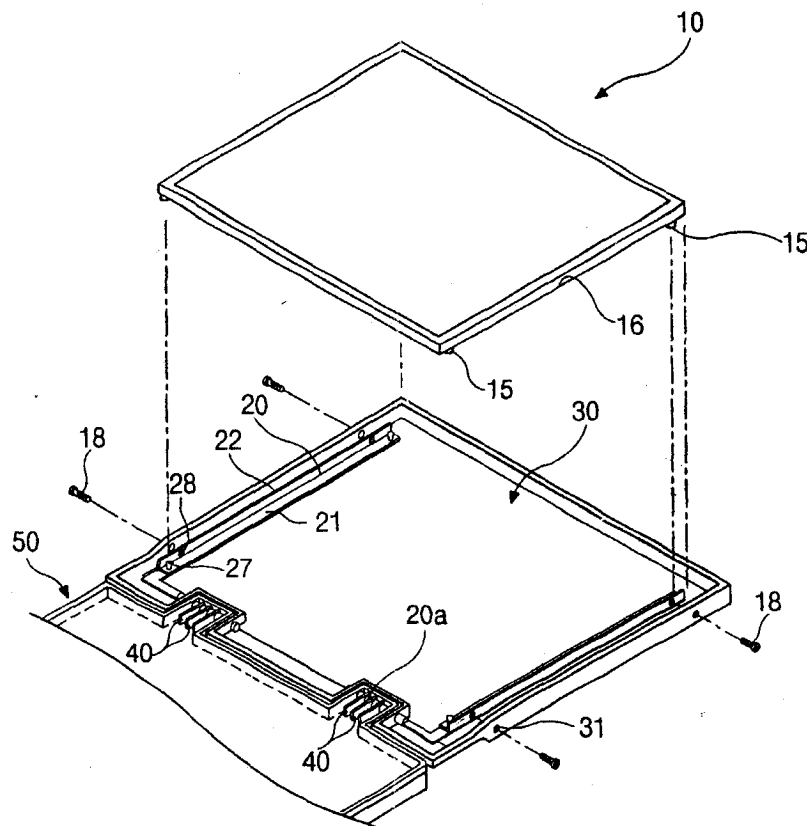
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(57) **ABSTRACT**

Disclosed is a computer that includes: a system body having an input device; a display module having a display surface and a rear surface; a display case having a side wall surface; and a hinge pivotally coupling the body to the display module, the hinge including a hinge frame having first and second surfaces, the first surface coupled with the rear surface of the display module, the second surface coupled with the side wall surface of the display case.

31 Claims, 14 Drawing Sheets



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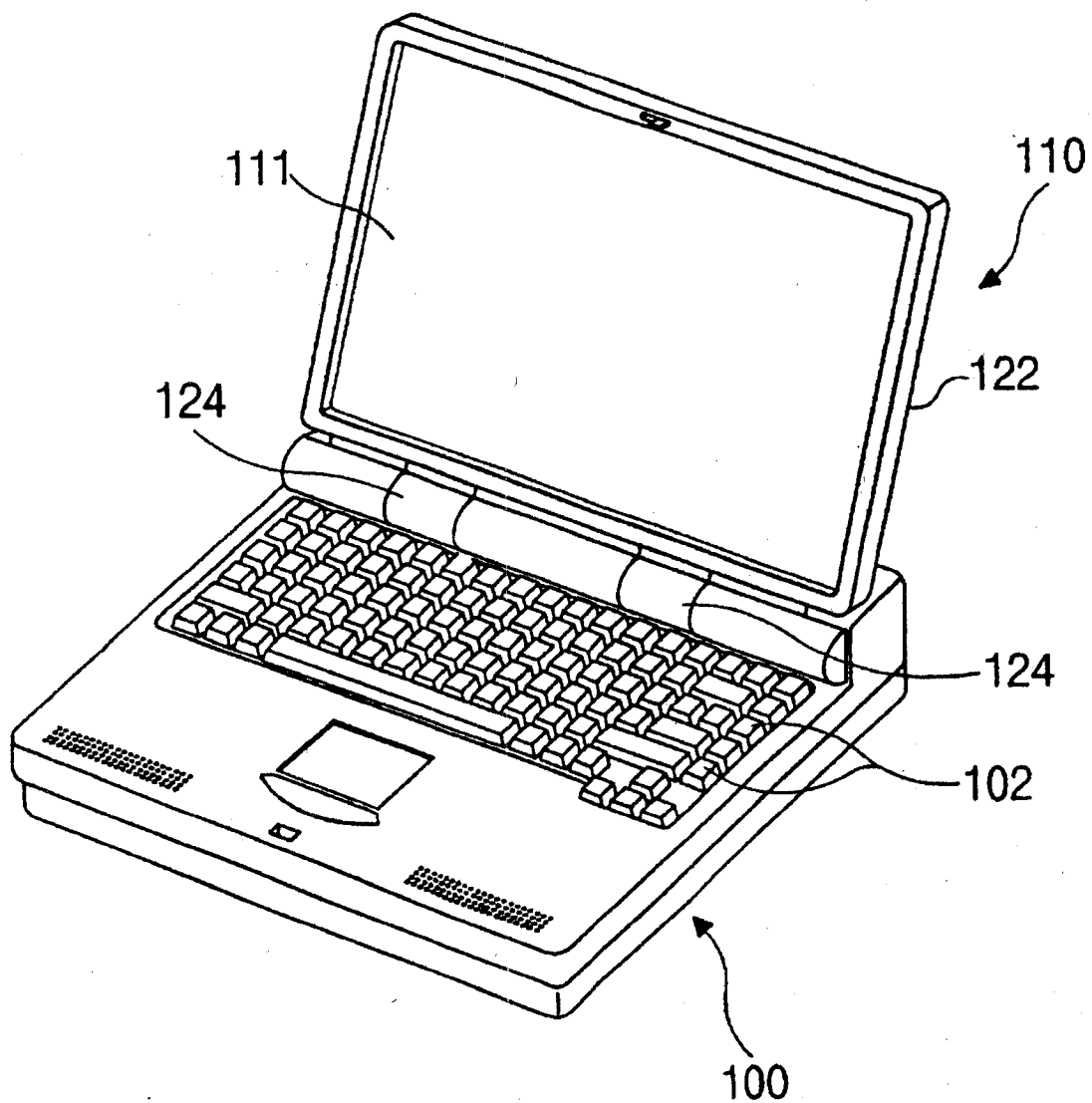


FIG. 1

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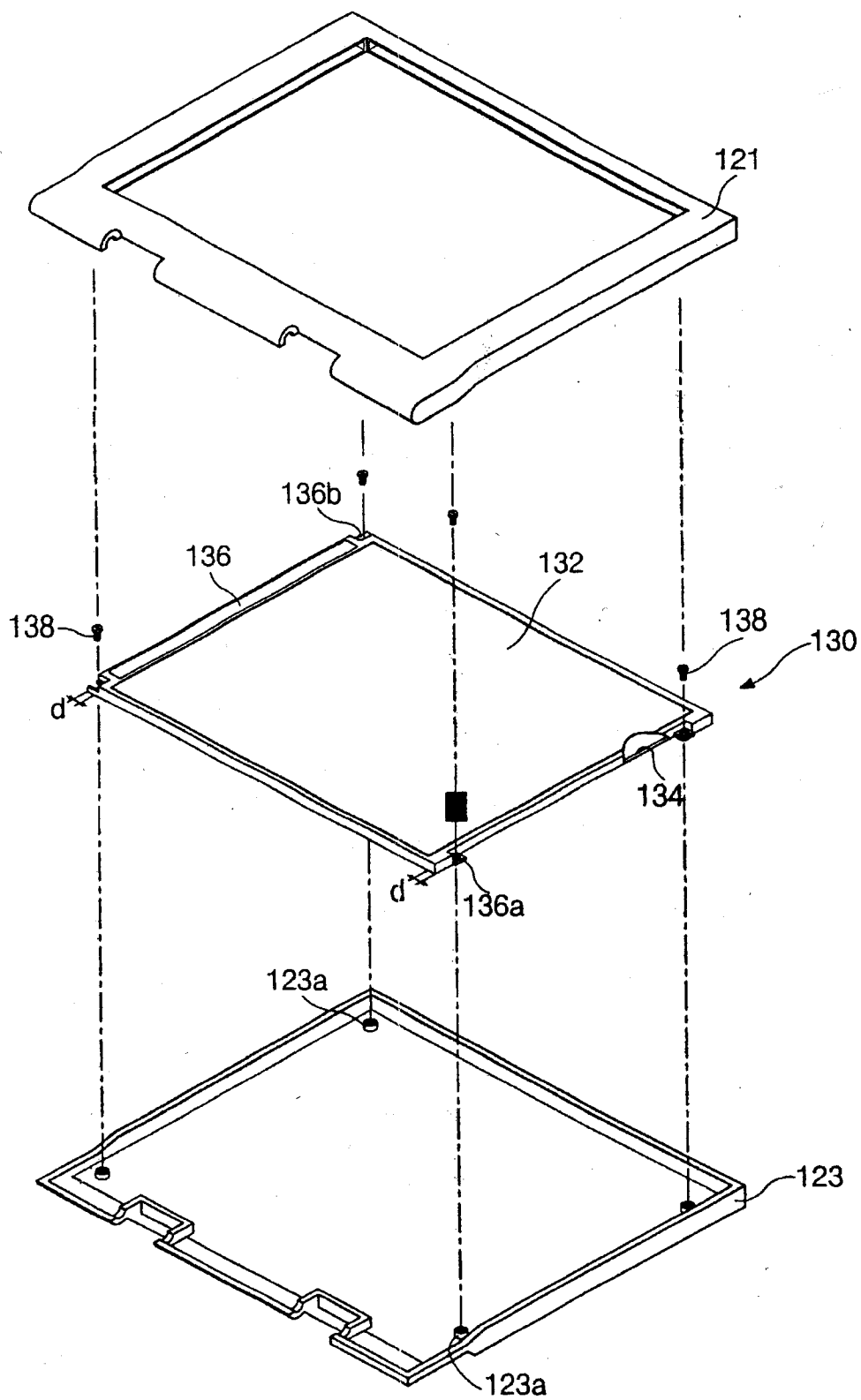


FIG. 2

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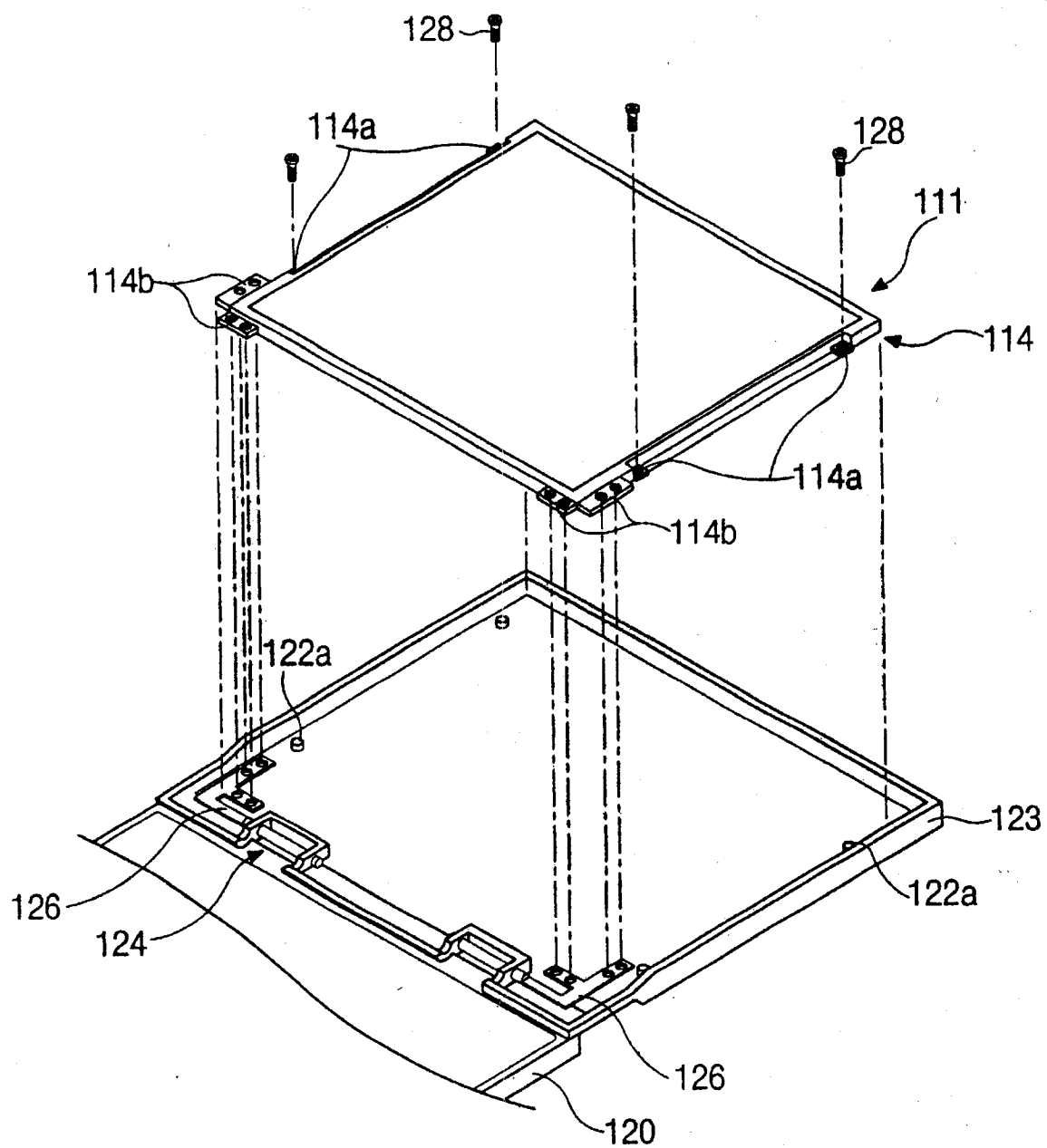


FIG. 3A

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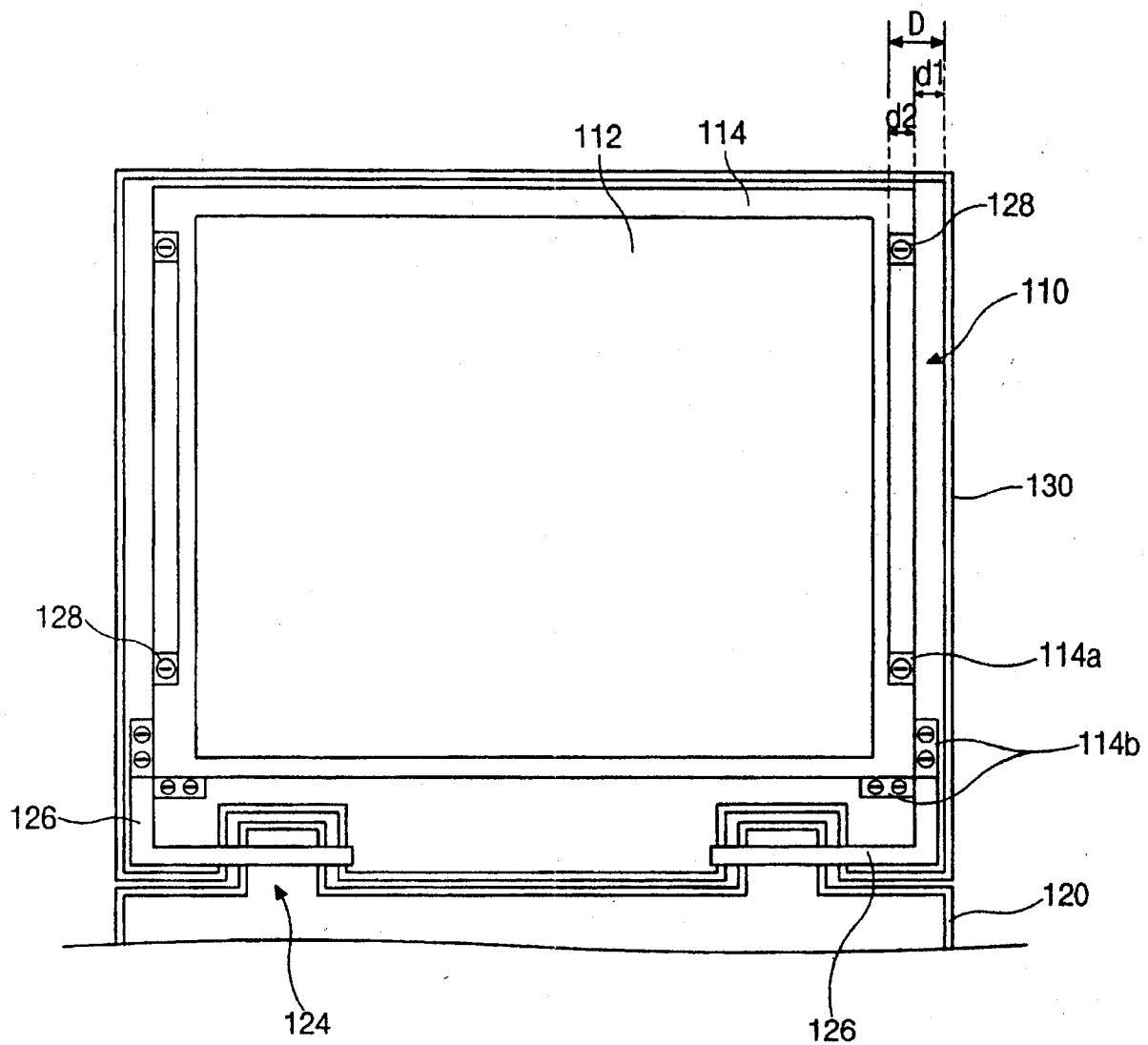


FIG. 3B

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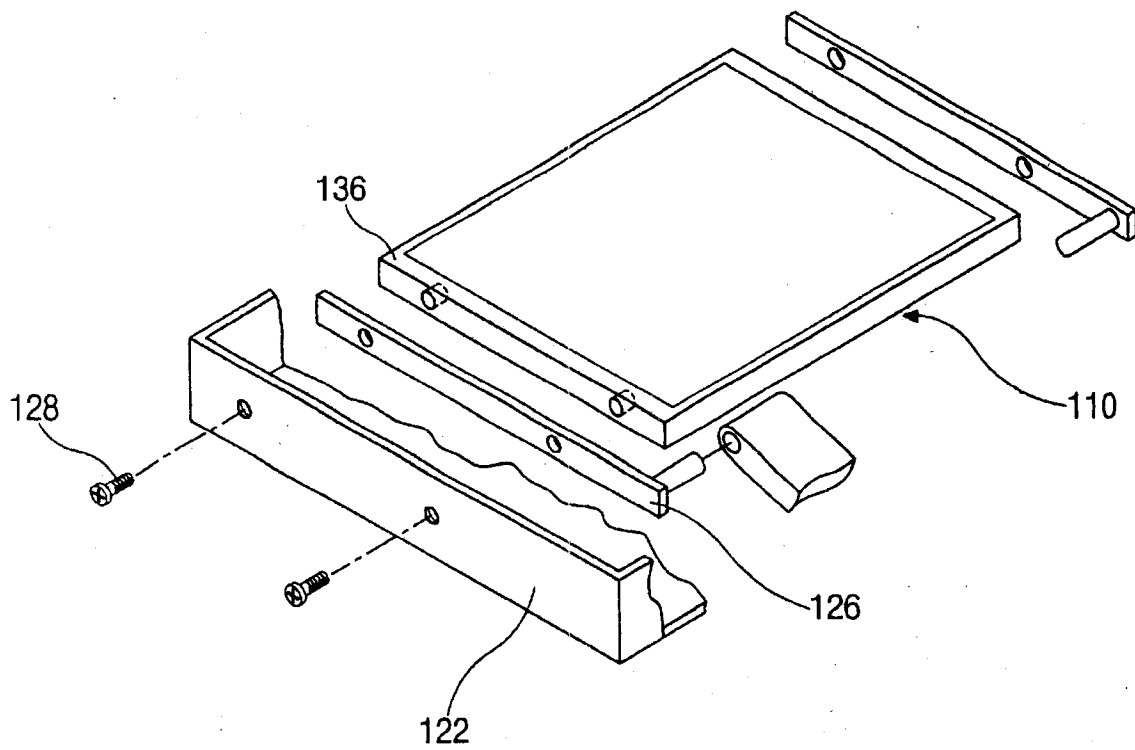


FIG. 4

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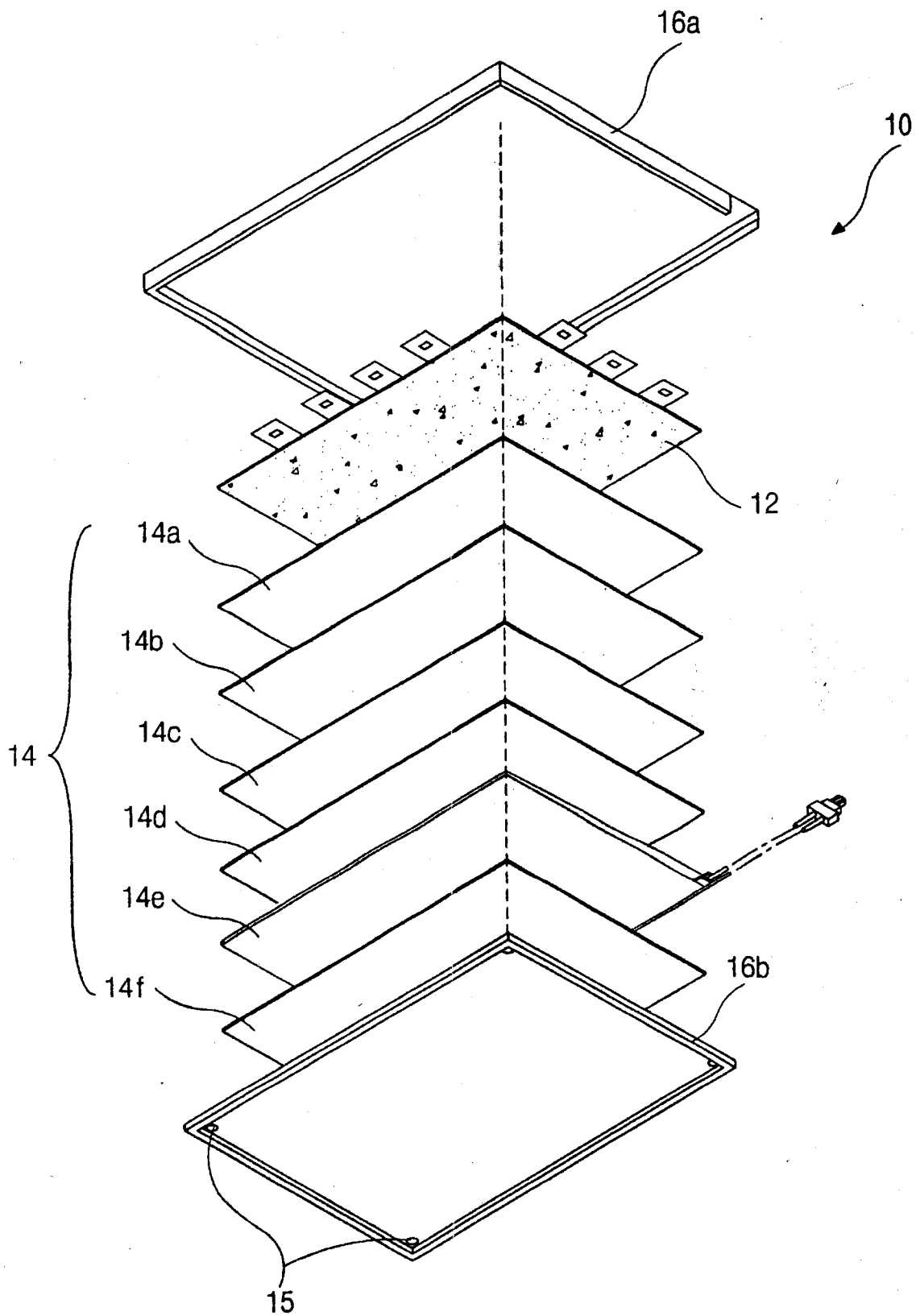


FIG. 5

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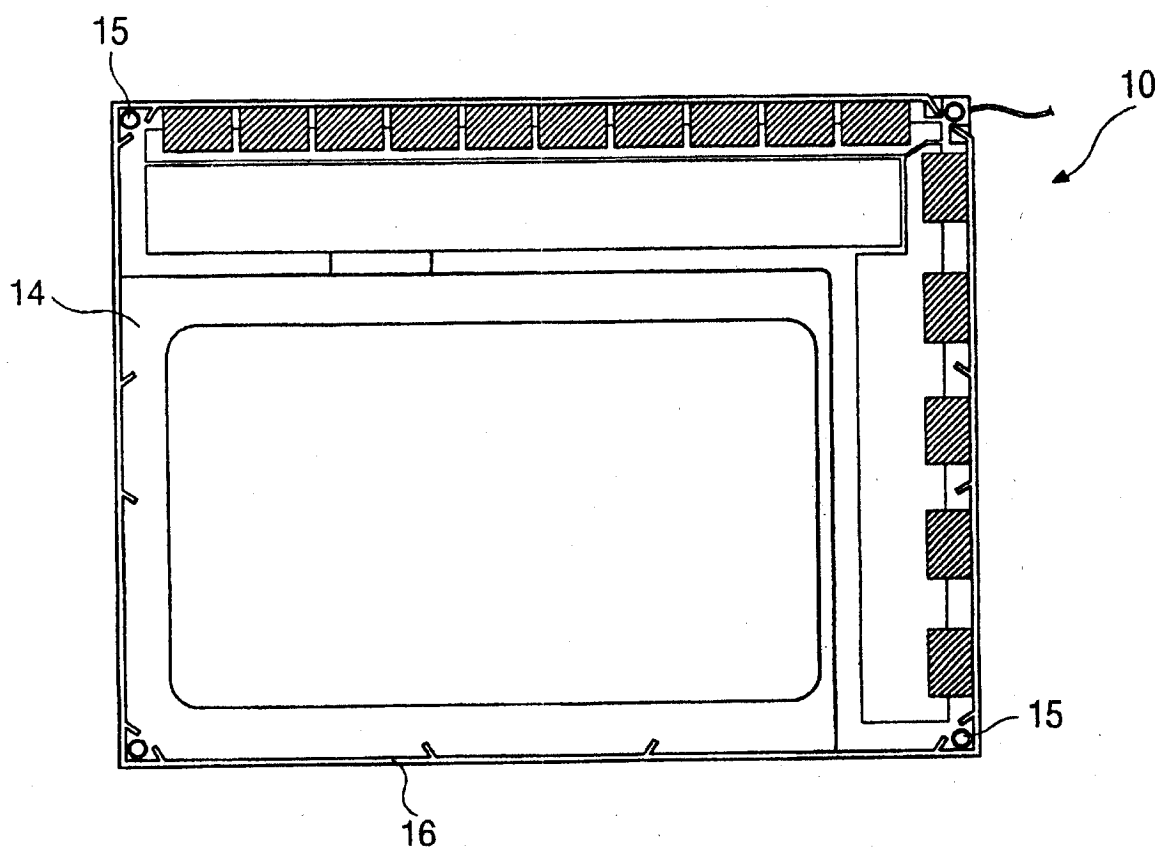


FIG. 6

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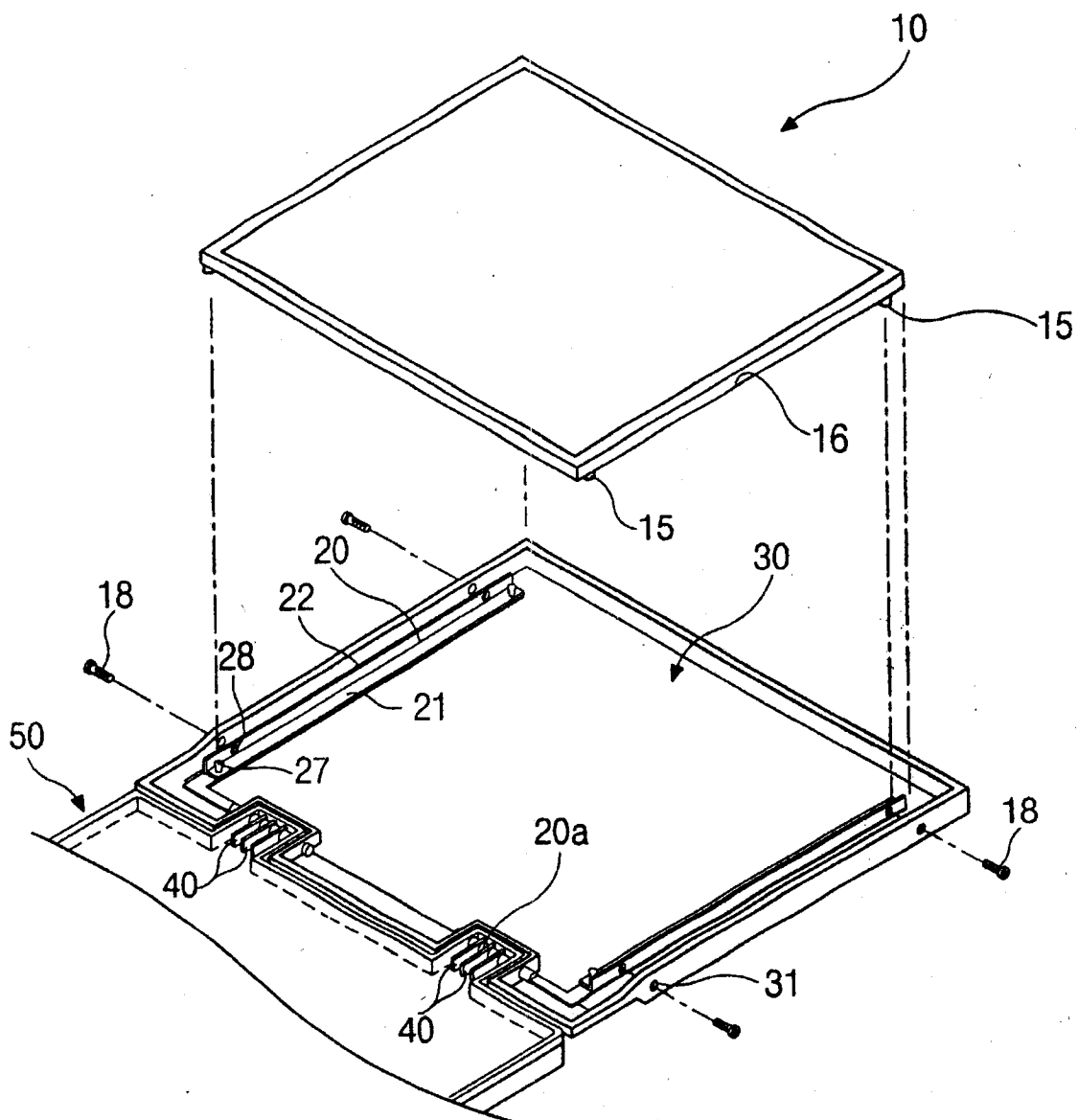


FIG. 7

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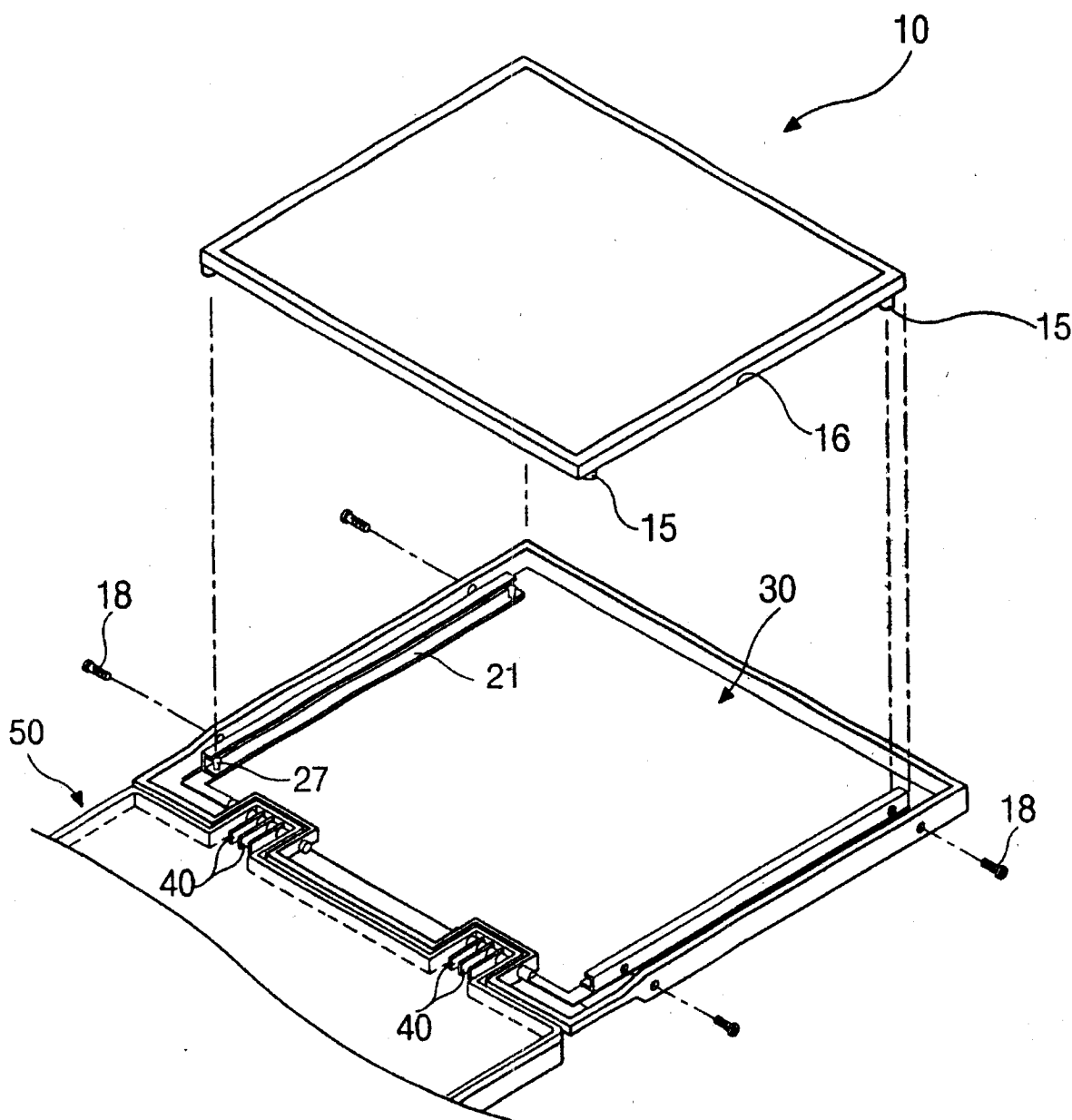


FIG. 8

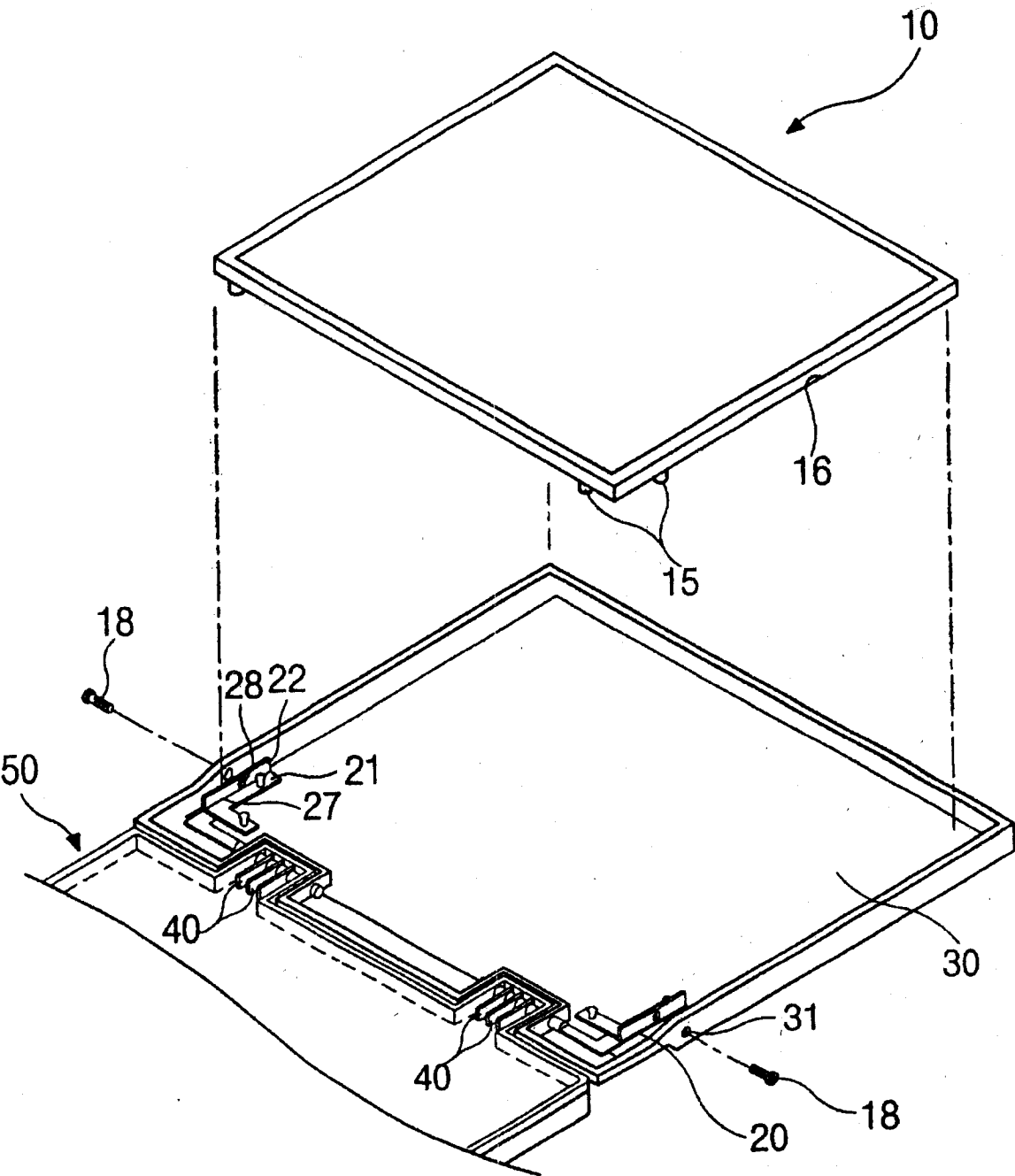


FIG. 9

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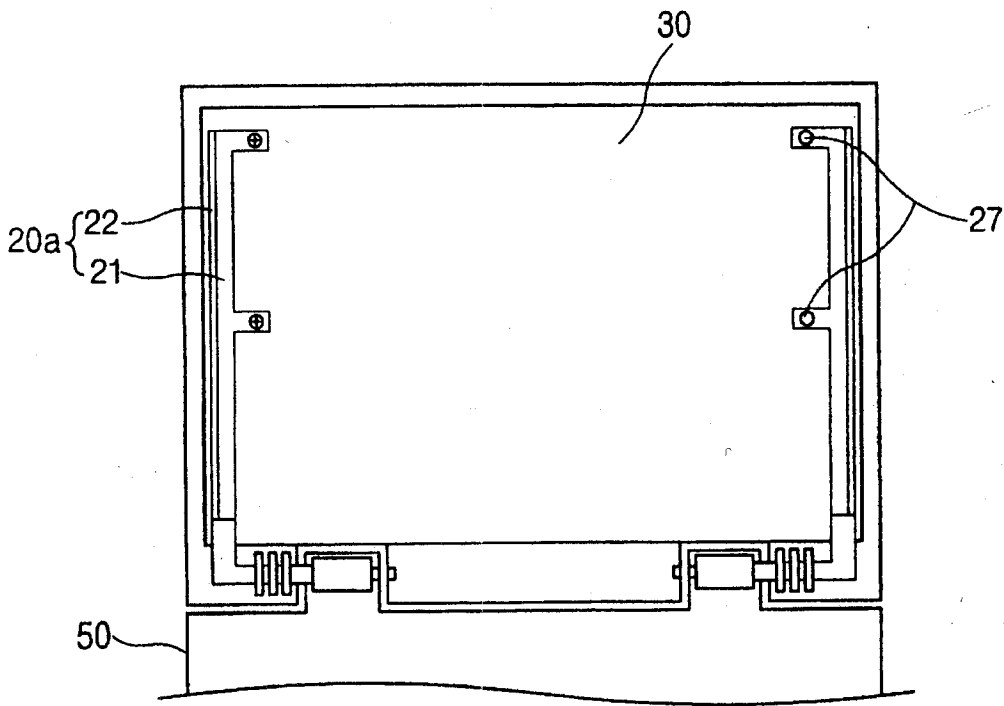


FIG. 10A

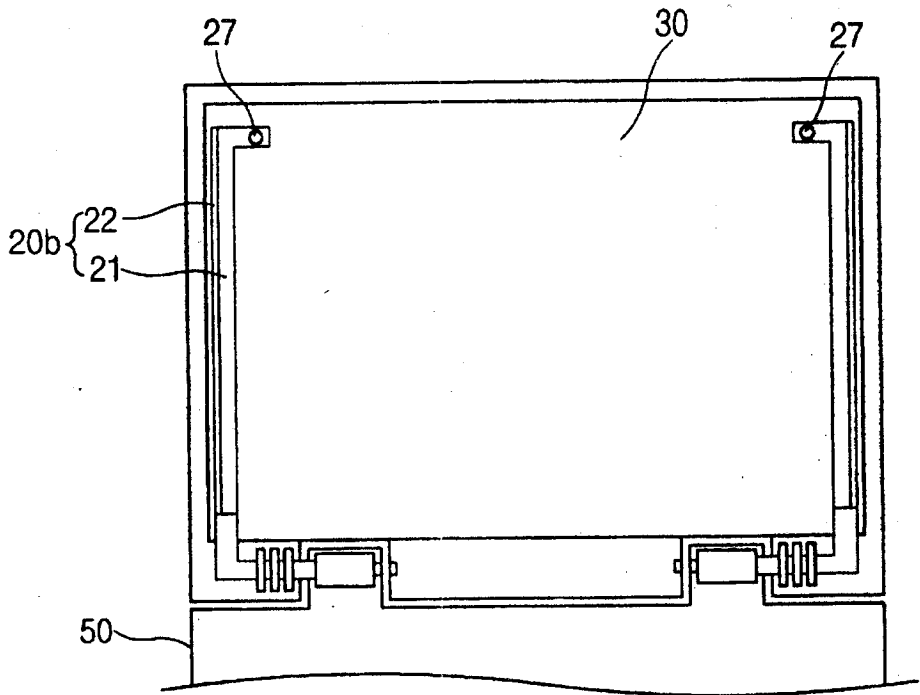


FIG. 10B

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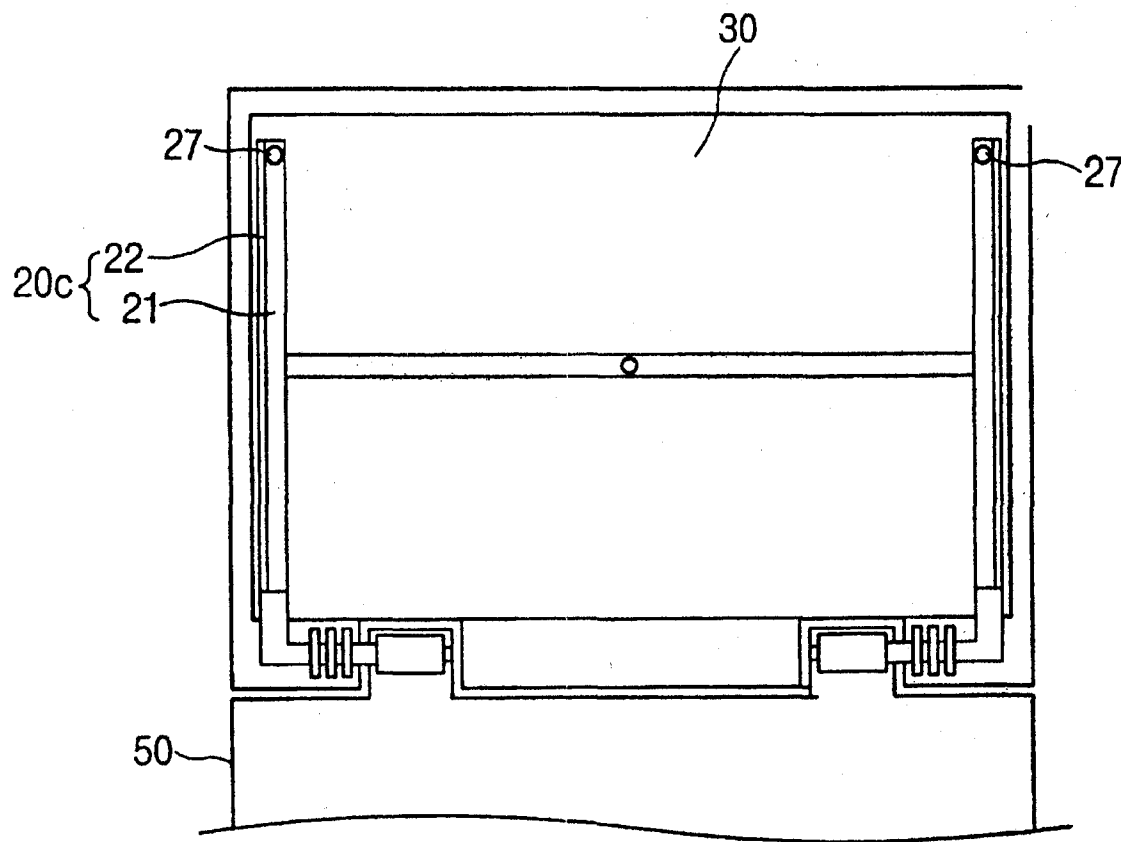


FIG. 10C

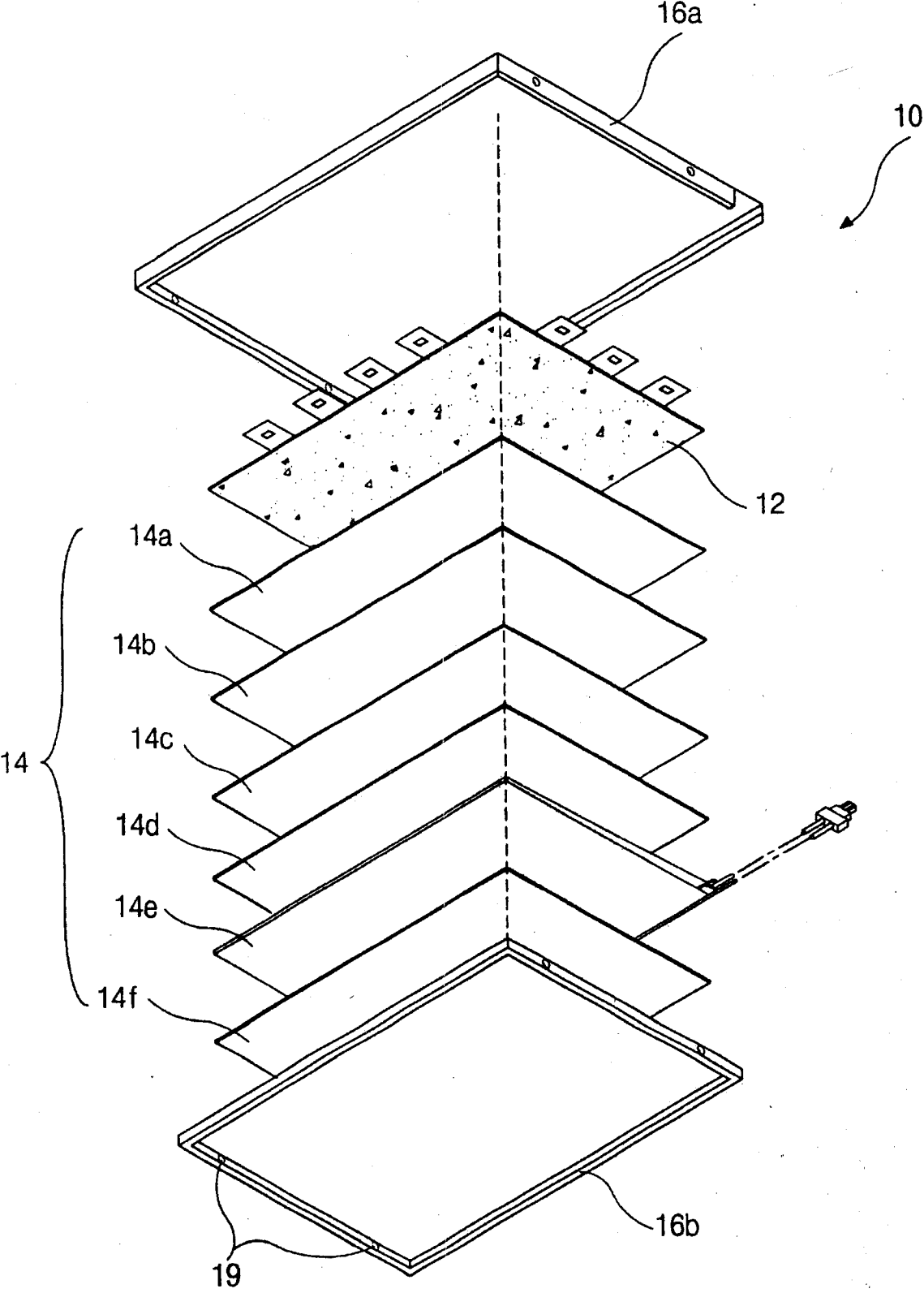


FIG. 11

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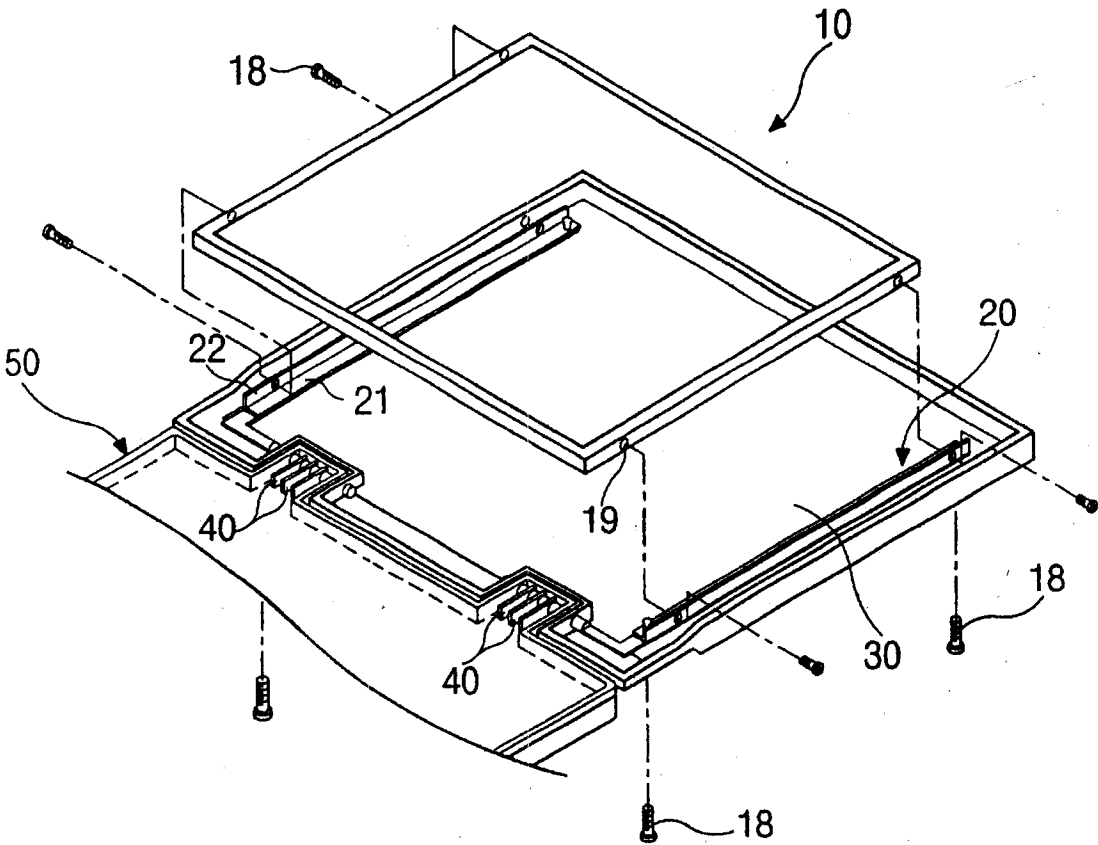


FIG. 12

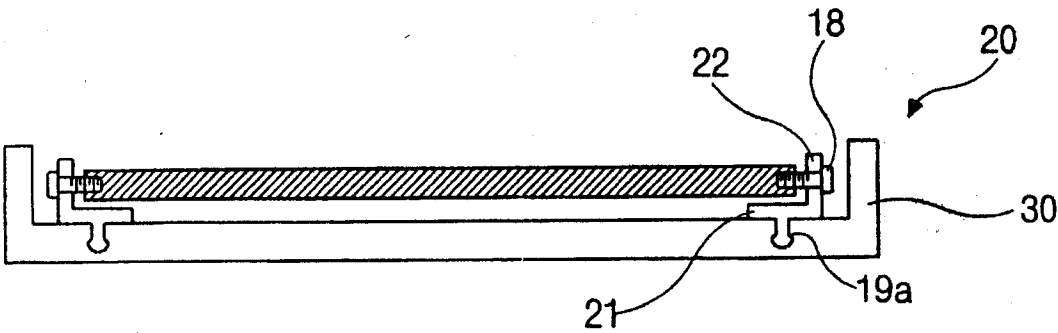


FIG. 13

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PORTABLE COMPUTER AND METHOD FOR MOUNTING A FLAT DISPLAY DEVICE MODULE

This application claims the benefit of Korean Patent Application No. 1998-48265, filed on Nov. 11, 1998, which is hereby incorporated by reference for all purposes as if fully set forth herein.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to a flat panel display device, and more particularly, to a flat panel display device mounting structure on a computer.

2. Description of the Related Art

Flat panel display devices include liquid crystal display (LCD) devices which are used widely, plasma display panels (PDP), and field emission displays (FED) which have been studied recently and may be applied to computers in the near future.

For convenience of explanation, the present invention will be discussed with respect to the LCD as an example of a flat screen type display device and a portable computer mounted with the LCD.

Referring to FIG. 1, a general portable computer such as a laptop or notebook computer typically includes a body 100, a flat panel display device assembly 110 coupled to the body 100 via a hinge mechanism 124. The flat panel display device assembly 110 has a flat panel display module 111 and a display case 122 supporting the module 111. The body 100 has an input device 102 such as a keyboard. As a flat panel display module 111, the LCD is widely used in portable computers and flat screen monitors.

Referring to FIG. 2 which shows a conventional assembly structure of the LCD device applied to a conventional portable computer, the display case 122 has a rear case 123 and a front case or frame 121 for mounting the LCD module 130. The rear case 123 has an outer surface and an inner surface and connecting ribs 123a formed at the corners.

The LCD module 130 has an LCD panel 132, a back light device 134 fixed to the back of the LCD panel 132, and a metal sash or supporting frame 136 for assembling the panel 132 and the back light device 134 along the edge.

At the corners of the metal sash 136, corresponding to the positions of the ribs 123a of the rear case 123, a plurality of protrusions 136a having holes are formed.

For mounting the LCD module 130 to the case 122, the LCD module 130 is placed on the rear case 123 and the holes of the metal sash 136 and the ribs 123a are fastened together preferably by screws 138. The front case 121 is coupled to the rear case 123.

Hereinafter, the way in which the LCD module is mounted to the case from the front toward the rear direction is defined as the front mounting method, and the assembled structure of the LCD module and the case made through the front mounting method is defined as the front mounting structure.

In the front mounting structure of the LCD module 130, since the protrusions 136a require additional space corresponding to the protruded width "d", the ratio of the display area of the LCD module 130 to the fixed size of the case 122 is reduced.

The front mounting structure may also include an additional feature to further support the LCD panel, as shown in FIGS. 3A and 3B.

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Referring to FIGS. 3A and 3B, a conventional LCD device assembly 110 includes an LCD panel 112, a back light device (not shown) for the LCD panel 112, and a display case 122 supporting an LCD module 111. The LCD panel 112 and the back light device are assembled by a metal sash 114 along the edges together with a plastic mold frame (not shown) supporting the back light device.

The display case 122 is coupled to a body 120 via a hinge mechanism 124, which may form the body 120. The display case 122 and the hinge mechanism 124 allow the LCD device assembly 110 to pivotally move with respect to the body 120.

Two opposite sides of the metal sash 114 include flanges 114a for assembling the LCD module 111 to the display case 122, and flanges 114b for assembling the LCD module 111 to the hinge frame or hinge arm 126. Hereinafter, the former is referred as a fixing flange and the latter is referred as a mounting flange in this specification for distinction purposes. As shown in FIG. 3B, the fixing flanges 114a have a protruding width d2 and the mounting flanges 114b have a protruding width d1. A screw hole is formed in each of the flanges 114a and 114b. On the inner or bottom interior surface of the display case 122, ribs 122a are formed corresponding to the holes of the fixing flange 114a.

To mount the LCD module 111, the hinge frame 126 and the mounting flanges 114b of the metal sash 114 are screwed together, and the fixing flanges 114a of the metal sash 114 and the ribs 122a are screwed together by bolts 128.

In the mounting structure shown in FIG. 3B, the metal sash or support frame 114 requires side spaces for the flanges 114a and 114b. Therefore, the side space D (d1+d2) results in a reduction of the ratio of the display area of the LCD panel 112 relative to the display case 122. Moreover, as the display panel size increases, the display case 122 becomes undesirably large, especially for a portable computer such as a laptop computer.

To solve the above problem, an assembling structure has been suggested, as shown in FIG. 4, which is a partial perspective view. The hinge arm or frame 126, the case 122 and the side wall portion of the display module 110 are screwed together by bolts 128. However, although the embodiment shown in FIG. 4 is a good solution, there may be some instances where it is desired to attach the hinge arm, the case and the side wall portion of the display module without using a screw hole in the side wall portion of the display module or to attach hinge arm with the case (FIG. 3A).

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a portable computer that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention is to minimize the non-display area of the LCD device.

Another object of the present invention is to provide a computer having a flat panel display device with a maximum display area and a minimal display case size.

A further object of the present invention is to provide a firm mounting structure for a flat panel display device on a computer.

Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages

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tages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

To achieve these and other advantages and the in accordance with the purpose of the present invention, as embodied and broadly described, the present invention provides, in one aspect, a computer including: a system body having an input device; a display module having a display surface and a rear surface; a display case having a side wall surface; and a hinge pivotally coupling the body to the display module, the hinge including a hinge frame having first and second surfaces, the first surface coupled with the rear surface of the display module, the second surface coupled with the side wall surface of the display case.

In another aspect, the present invention provides a portable computer including: a system body; a display module having a display surface and a side wall surface; a display case having an inner surface; and a hinge pivotally coupling the body to the display case, the hinge including a hinge frame having first and second surfaces, the first surface coupled with the inner surface of the display case, the second surface coupled with the side wall surface of the display module.

In another aspect, the present invention provides a computer including: a system body; a display module having a display surface; a display case having side walls, the display module secured between the side walls of the display case; and a hinge pivotally coupling the body to the display case, the hinge including a hinge frame coupled to the inner surface of the display case.

The present invention according to a first embodiment provides a method for mounting a display module in a portable computer including a system body, a display case having a side wall surface, a hinge having a hinge frame having first and second surfaces, the first surface being substantially parallel to a rear surface of the display module, the second surface being substantially parallel to the side wall surface of the display case, the hinge pivotally coupling the system body to the display case, the method comprising: arranging the hinge frame so that the first surface thereof is positioned between the display case and the rear surface of the display module, and so that the second surface thereof is positioned between the display module and the side wall surface of the display case; fastening the first surface of the hinge frame to the rear surface of the display module; and fastening the second surface of the hinge frame to the side wall surface of the display case.

The present invention according to a second embodiment provides a method for mounting a display module having a side wall surface in a portable computer including a system body, a display case having inner and side wall surfaces, a hinge having a hinge frame having first and second surfaces, the first surface being substantially parallel to a rear surface of the display module, the second surface being substantially parallel to the side wall surface of the display case, the hinge pivotally coupling the system body to the display case, the method comprising: arranging the hinge frame so that the first surface thereof is positioned between the display case and the rear surface of the display module, and so that the second surface thereof is positioned between the display module and the side wall surface of the display case; fastening the first surface of the hinge frame to the inner surface of the display case; and fastening the second surface of the hinge frame to the side wall surface of the display module.

The present invention according to a second embodiment also provides a method for mounting a display module

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having a side wall surface in a portable computer including a system body, a display case having an inner and two side wall surfaces, a hinge having a hinge frame, the hinge pivotally coupling the system body to the display case, the method comprising: arranging the hinge frame so that a surface thereof is positioned between the inner surface of the display case and the rear surface of the display module; fastening the surface of the hinge frame to the inner surface of the display case; and securing the display module between the side walls of the display case.

Preferably, the display module is a liquid crystal display device (LCD) module.

Preferably, the first and second surfaces of the hinge frame are substantially perpendicular to each other.

Preferably, the first surface of the hinge frame has at least one fixing protrusion protruded toward the rear surface of the display module, and the rear surface of the display module has at least one fixing hole corresponding to the fixing protrusion of the first surface.

Preferably, the fixing protrusion is a fastener.

Preferably, the second surface of the hinge frame is screw-coupled with the side wall surface of the display case.

Preferably, the hinge frame further has a third surface for supporting an edge of the display surface of the display module, and the third surface is substantially perpendicular to the second surface.

Preferably, the fixing protrusion is a fastener.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understand of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

FIG. 1 is a perspective view showing a general portable computer;

FIG. 2 shows a structure for mounting an LCD device for a portable computer;

FIGS. 3A and 3B are a perspective view and a front view, respectively, showing a structure for mounting an LCD device for a portable computer;

FIG. 4 is a partial view showing another mounting structure of the LCD device for a conventional portable computer;

FIG. 5 is an exploded perspective view illustrating a structure for mounting a liquid crystal display module of a portable computer according to a first embodiment of the present invention;

FIG. 6 is a bottom view illustrating a rear surface of a liquid crystal display module of a portable computer according to the first embodiment of the present invention;

FIG. 7 is a partially exploded perspective view illustrating a structure for mounting a liquid crystal display module of a portable computer according to a first embodiment of the present invention;

FIG. 8 is a partially exploded perspective view illustrating a modification of a structure for mounting a liquid crystal display module of a portable computer according to a first embodiment of the present invention;

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FIG. 9 is a partially exploded perspective view illustrating another modification of a structure for mounting a liquid crystal display module of a portable computer according to a first embodiment of the present invention;

FIGS. 10A, 10B and 10C are partially exploded perspective views illustrating various modifications of a structure for mounting a liquid crystal display module of a portable computer according to a first embodiment of the present invention

FIG. 11 is an exploded perspective view illustrating a liquid crystal display module according to a second embodiment according to the invention;

FIG. 12 is a partially exploded perspective view illustrating a structure for mounting a liquid crystal display module of a portable computer according to a second embodiment of the present invention; and

FIG. 13 is a partially exploded perspective view illustrating another structure for mounting a liquid crystal display module of a portable computer according to a second embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference will now be made in detail to the preferred embodiments of the present invention, an example of which is illustrated in the accompanying drawings.

Referring FIGS. 5 and 6, which show a first embodiment, a display module 10 (which may be a liquid crystal display module) has a display panel 12 and a back light device 14, both of which are assembled to each other by first and second frames 16a and 16b. The back light device 14 comprises a reflective plate 14a, a wave guide plate 14b, a first diffuser/protecting sheet 14c, a first prism sheet 14d, a second prism sheet 14e, and a second diffuser/protecting sheet 14f, which are layered in this order. The display panel 12 and the back light device 14 are supported by first and second frames 16a and 16b, and the second frame 16b has a fixing hole 15. As shown in FIG. 5, a plurality of fixing holes 15 are preferably arranged at each corner of the display module 10. The fixing holes 15 may have the shape of a rib, if necessary.

FIG. 7 is a partially exploded perspective view illustrating structure for mounting a liquid crystal display module of a portable computer according to a first.

A hinge mount 40 is positioned at a protruded portion of a system body 50 such that a display assembly having the display module 10 and the display case 30 pivotally moves with respect to the body 50. A hinge frame 20 is positioned on an inner, or bottom interior, surface of the display case 30. The hinge frame 20 is comprised of a pin portion 20a at its one end, which is inserted into the hinge mount 40, and a "L"-shaped portion 20b which has first and second surfaces 21 and 22. The first surface 21 is parallel to a rear surface of the display module 10, and the second surface 22 is parallel to a side wall surface of the display module 10. The pin portion 20a can be coupled to the L-shaped portion 20b or be integrally formed with the L-shaped portion 20b. The hinge frame 20 also extends along the side wall surface of the display module 10. The first surface 21 has at least one fixing protrusion 27 corresponding to the fixing holes 15 of the rear surface of the display module 10, and the second surface 22 has at least one hole 28 corresponding to the through holes 31 of the side wall surface of the display case 30.

A preferred method for mounting the display module 10 according to the first embodiment is explained hereinafter.

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The fixing protrusion 27 of the second surface 22 of the L-shaped portion 20b of the hinge frame 20 is inserted into the fixing holes 15 of the display module 10 such that the display module 10 is secured. Then a coupling member 18 such as a screw and a nail passes through the hole 28 of the second surface 22 and the through hole 31 of the display case 30 such that the hinge frame 20 is fixed to the display case 30.

Also, the fixing protrusion 27 preferably has the shape of a plastic hook or a fastener for firmly holding the display module 10, and an inlet portion of the fixing hole 15 is preferably narrower than an interior portion of the fixing hole 15.

To provide a more shockproof and shake-proof mounting structure, the hinge frame 20 can have the shape of "C" as shown in FIG. 8. That is, the hinge frame 20 further has a third surface 23 to support both upper edges of opposing sides of the display module 10 parallel to the hinge frame 20. The first and third surfaces 21 and 23 can be integrally formed with the second surface 22, or can be attachable brackets.

FIG. 9 shows another modification of the first embodiment.

The hinge frame 20 can have a reverse "F" shaped first surface 21 to hold the display module 10, instead of a long elongated first surface 21 (see FIG. 7).

FIGS. 10A, 10B and 10C are other modifications of a mounting structure according to the first embodiment.

The hinge frames 20a, 20b and 20c may have various shapes of first surfaces 21 to enhance a fixing force of a display module 10.

FIG. 11 illustrates a second embodiment, wherein the structure of the display module 10 is similar to that shown in FIG. 5, and therefore, the explanation thereof is not repeated here. However, the display module 10 has a plurality of fixing holes 19 on the side wall surface thereof other than the rear surface thereof. The fixing holes 19 are for a side mounting method wherein the side wall of the display module 10 is coupled to a hinge frame or to the case. That is, the display module 10 can be assembled to the hinge frame 20 (see FIG. 7) not to the case 30 (see FIG. 7). It is also possible that the display module 10 is assembled to the case 30 directly, without engaging the hinge frame 20 therebetween.

FIG. 12 shows an exemplary mounting structure wherein the hinge frame is assembled to the inner, or bottom interior, surface of the case 30 and the display module 10 is mounted inside of the case 30. Preferably, the hinge frame 20 has an "L" shape and has a first surface 21 contacting with the rear surface of display module 10 and a second surface 22 contacting with the side wall surface of the display module 10. The display case 30 has a plurality of screw holes (not shown) on the inner surface thereof, and the first surface 21 of the hinge frame 20 has a plurality of screw holes 25 corresponding to the screw holes of the display case 30. Further, the second surface 21 of the hinge frame 20 preferably has a plurality of screw holes 26 corresponding to the screw holes 19 of the side wall surface of the display module 10. Thus, the first surface 21 of the hinge frame 20 is coupled with the display case 30, and the second surface 22 of the hinge frame 20 is coupled with the display module 10.

FIG. 13 shows another exemplary mounting structure of the second embodiment. The structure of FIG. 13 also shows a mounting structure wherein the hinge frame 20 is assembled to the inner surface of the case 30.

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The first surface 21 of the hinge frame 20 has a plurality of plastic hooks or fasteners protruded toward the inner surface of the case 30, and the display case 30 has a plurality of fastener fixing holes 19a corresponding to the fastener, thereby the first surface 21 of the hinge frame 20 is coupled with the display case 30 by pressing the first surface 21 without tightening a screw.

In the second embodiment, instead of a screw and fastener, a nail can be employed. Further, the hinge frame may be "C" shaped, and a bracket having a long length may be used instead of the hinge frame integrally formed with the pin portion. The hinge frame may have a short length.

As described until here, using the mounting structure according to the invention, the display area is maximized, and a more shock-proof display assembly is provided. Further, the mounting structure according to one embodiment of the invention has an advantage that the display assembly can be assembled to the case without tightening a screw into the side wall surface of the display module. The invention also shows that the hinge frame of the invention can be assembled to a rear surface of the display module or to an inner surface of the case.

Other embodiments of the invention will be apparent to the skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with the true scope and spirit of the invention being indicated by the following claims.

What is claimed is:

1. A portable computer, comprising:
a system body having an input device;
a display module having a display surface and a rear surface;
a display case having a side wall surface; and
a hinge pivotally coupling the system body to the display module, the hinge including a hinge frame having first and second surfaces, the first surface coupled with the rear surface of the display module, the second surface coupled with the side wall surface of the display case.
2. The computer of claim 1, wherein the display module is a liquid crystal display (LCD) module.
3. The computer of claim 2, wherein the first and second surfaces of the hinge frame are substantially perpendicular to each other.
4. The computer of claim 2, wherein the first surface of the hinge frame has at least one fixing protrusion protruded toward the rear surface of the display module, and the rear surface of the display module has at least one fixing hole corresponding to the fixing protrusion of the first surface.
5. The computer of claim 4, wherein the fixing protrusion is a fastener.
6. The computer of claim 4, wherein the second surface of the hinge frame is screw-coupled with the side wall surface of the display case.
7. The computer of claim 2, wherein the hinge frame further has a third surface for supporting an edge of the display surface of the display module, and the third surface is substantially perpendicular to the second surface.
8. A portable computer, comprising:
a system body;
a display module having a display surface and a side wall surface;
a display case having an inner surface; and
a hinge pivotally coupling the system body to the display case, the hinge including a hinge frame having first and

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second surfaces, the first surface coupled with the inner surface of the display case, the second surface coupled with the side wall surface of the display module.

9. The computer of claim 8, wherein the display module is a liquid crystal display (LCD) module.

10. The computer of claim 9, wherein the first surface of the hinge frame is screw-coupled with the inner surface of the display case, and the second surface of the hinge frame is screwcoupled with the side wall surface of the display module.

11. The computer of claim 9, wherein the first surface of the hinge frame has at least one fixing protrusion protruded toward the inner surface of the display case, and the inner surface has at least one fixing hole corresponding to the fixing protrusion of the first surface.

12. The computer of claim 11, wherein the fixing protrusion is a fastener.

13. A computer, comprising:

a system body;

a display module having a display surface;

a display case having side walls, the display module secured between the side walls of the display case; and
a hinge pivotally coupling the body to the display case, the hinge including a hinge frame coupled to the inner surface of the display case.

14. The computer of claim 13, wherein the display module is a liquid crystal display (LCD) module.

15. The computer of claim 14, wherein the hinge frame is screw-coupled with the inner surface of the display case.

16. The computer of claim 14, wherein the hinge frame has at least one fixing protrusion protruded toward the inner surface of the display case, and the inner surface has at least one fixing hole corresponding to the fixing protrusion of the hinge frame.

17. The computer of claim 16, wherein the fixing protrusion is a fastener.

18. A method for mounting a display module in a portable computer including a system body, a display case having a side wall surface, a hinge having a hinge frame having first and second surfaces, the first surface being substantially parallel to a rear surface of the display module, the second surface being substantially parallel to the side wall surface of the display case, the hinge pivotally coupling the system body to the display case, the method comprising:

arranging the hinge frame so that the first surface thereof is positioned between the display case and the rear surface of the display module, and so that the second surface thereof is positioned between the display module and the side wall surface of the display case;

fastening the first surface of the hinge frame to the rear surface of the display module; and
fastening the second surface of the hinge frame to the side wall surface of the display case.

19. The method of claim 18, wherein the display module is a liquid crystal display (LCD) module.

20. The method of claim 18, wherein the first surface of the hinge frame has at least one fixing protrusion protruded toward the rear surface of the display module, and the rear surface of the display module has at least one fixing hole corresponding to the fixing protrusion of the first surface of the hinge frame.

21. The method of claim 18, wherein the first surface of the hinge frame is screw-coupled with the rear surface of the display module.

22. The method of claim 18, wherein the second surface of the hinge frame is screw-coupled with the side wall surface of the display case.

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23. A method for mounting a display module having a side wall surface in a portable computer including a system body, a display case having inner and side wall surfaces, a hinge having a hinge frame having first and second surfaces, the first surface being substantially parallel to a rear surface of the display module, the second surface being substantially parallel to the side wall surface of the display case, the hinge pivotally coupling the system body to the display case, the method comprising:

- arranging the hinge frame so that the first surface thereof is positioned between the display case and the rear surface of the display module, and so that the second surface thereof is positioned between the display module and the side wall surface of the display case;
- fastening the first surface of the hinge frame to the inner surface of the display case; and
- fastening the second surface of the hinge frame to the side wall surface of the display module.

24. The method of claim 23, wherein the display module is a liquid crystal display (LCD) module.

25. The method of claim 23, wherein the first surface of the hinge frame is screw-coupled with the inner surface of the display case.

26. The method of claim 23, wherein the second surface of the hinge frame is screw-coupled with the side wall surface of the display module.

10

27. The method of claim 23, wherein the first surface of the hinge frame is coupled to the inner surface of the display case by a fastener.

28. A method for mounting a display module having a side wall surface in a portable computer including a system body, a display case having an inner and two side wall surfaces, a hinge having a hinge frame, the hinge pivotally coupling the system body to the display case, the method comprising:

- arranging the hinge frame so that a surface thereof is positioned between the inner surface of the display case and the rear surface of the display module;
- fastening the surface of the hinge frame to the inner surface of the display case; and
- securing the display module between the side walls of the display case.

29. The method of claim 28, wherein the display module is a liquid crystal display (LCD) module.

30. The method of claim 28, wherein the surface of the hinge frame is screw-coupled with the inner surface of the display case.

31. The method of claim 28, wherein the surface of the hinge frame is coupled to the inner surface of the display case by a fastener.

* * * * *

PATENT APPLICATION



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INITIALS _____

CONTENTS

	Date received (Incl. C. of M.) or Date Mailed	Date received (Incl. C. of M.) or Date Mailed
1. Application _____ papers.		42. _____
2. <u>LTNRE DEC</u>	<u>12/9/99</u>	43. _____
3. <u>DEC</u>	<u>3/5/00</u>	44. _____
4. <u>EUT</u>	<u>3/5/00</u>	45. _____
5. <u>Priority</u>	<u>3/5/00</u>	46. _____
6. <u>Can FR</u>	<u>3/5/00</u>	47. _____
7. <u>CFR</u>	<u>3/22/00</u>	48. _____
5-71-01 <u>Non Final</u>	<u>5-23-01</u>	49. _____
9. <u>Drawings Corr</u>	<u>8-23-01</u>	50. _____
10. <u>Amend II</u>	<u>8-23-01</u>	51. _____
11-1-01 <u>Final Rep</u>	<u>11/2/01</u>	52. _____
12. <u>Amend B (NE)</u>	<u>1-29-02</u>	53. _____
13. <u>Interview Summary</u>	<u>2-8-2</u>	54. _____
14. <u>Ex Amndt C</u>	<u>2-21-2</u>	55. _____
22-2-02 <u>allowance</u>	<u>15/2/02</u>	56. _____
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SEARCHED

Class	Sub.	Date	Exmr.
361	679-683	5/16-17/01	HL
292	8, 56, 32, 99, 11	5/16-17/01	HL
248	917-923	5/17/01	HL
349	58, 59, 60	5/17/01	HL
14	342, 307	5/14/01	HL
updated search see above		10/15/01	HL
updated 2/8/02 ylu			

INTERFERENCE SEARCHED

Class	Sub.	Date	Exmr.
361	681		
292	683		
349	58	2/8/02	ylu

**SEARCH NOTES
(INCLUDING SEARCH STRATEGY)**

	Date	Exmr.
Text search. portable adj. computer display adj. module display adj. case hinge	2/8/02	ylu

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ISSUE SLIP STAPLE AREA (for additional cross references)

POSITION	INITIALS	ID NO.	DATE
FEE DETERMINATION	<i>Map</i>		<i>11/22/01</i>
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FORMALITY REVIEW	<i>LSM</i>	<i>72223</i>	<i>12/8/99</i> <i>3/8/00</i>

INDEX OF CLAIMS

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U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

11/23/1999 MPEOPLES 00000017 09437222

01 FC:101	760.00 OP
02 FC:103	198.00 OP
03 FC:102	234.00 OP
04 FC:105	130.00 OP

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ABSTRACT OF THE DISCLOSURE

Disclosed is a computer that includes: a system body having an input device; a display module having a display surface and a rear surface; a display case having a side wall surface; and a hinge pivotally coupling the body to the display module, the hinge including a hinge
5 frame having first and second surfaces, the first surface coupled with the rear surface of the display module, the second surface coupled with the side wall surface of the display case.

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U. S. PATENT APPLICATION

OF

YOUNG WOO CHO

JONG WHAN KIM

DAE HEE PARK

FOR

PORTABLE COMPUTER AND

METHOD FOR MOUNTING A FLAT PANEL DISPLAY DEVICE MODULE

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This application claims the benefit of Korean Patent Application No. 1998-48265, filed on November 11, 1998, which is hereby incorporated by reference for all purposes as if fully set forth herein.

BACKGROUD OF THE INVENTION

Field of the Invention

The present invention relates generally to a flat panel display device, and more particularly, to a flat panel display device mounting structure on a computer.

Description of the Related Art

Flat panel display devices include liquid crystal display (LCD) devices which are used widely, plasma display panels (PDP), and field emission displays (FED) which have been studied recently and may be applied to computers in the near future.

For convenience of explanation, the present invention will be discussed with respect to the LCD as an example of a flat screen type display device and a portable computer mounted with the LCD.

Referring to Fig. 1, a general portable computer such as a laptop or notebook computer typically includes a body 100, a flat panel display device assembly 110 coupled to the body 100 via a hinge mechanism 124. The flat panel display device assembly 110 has a flat panel display module 111 and a display case 122 supporting the module 111. The body 100 has an input device 102 such as a keyboard. As a flat panel display module 111, the LCD is widely used in portable computers and flat screen monitors.

Referring to Fig. 2 which shows a conventional assembly structure of the LCD device applied to a conventional portable computer, the display case 122 has a rear case 123 and a front case or frame 121 for mounting the LCD module 130. The rear case 123 has an outer

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surface and an inner surface and connecting ribs 123a formed at the corners.

The LCD module 130 has an LCD panel 132, a back light device 134 fixed to the back of the LCD panel 132, and a metal sash or supporting frame 136 for assembling the panel 132 and the back light device 134 along the edge.

5 At the corners of the metal sash 136, corresponding to the positions of the ribs 123a of the rear case 123, a plurality of protrusions 136a having holes are formed.

For mounting the LCD module 130 to the case 122, the LCD module 130 is placed on the rear case 123 and the holes of the metal sash 136 and the ribs 123a are fastened together preferably by screws 138. The front case 121 is coupled to the rear case 123.

10 Hereinafter, the way in which the LCD module is mounted to the case from the front toward the rear direction is defined as the front mounting method, and the assembled structure of the LCD module and the case made through the front mounting method is defined as the front mounting structure.

15 In the front mounting structure of the LCD module 130, since the protrusions 136a require additional space corresponding to the protruded width "d", the ratio of the display area of the LCD module 130 to the fixed size of the case 122 is reduced.

The front mounting structure may also include an additional feature to further support the LCD panel, as shown in Figs. 3A and 3B.

20 Referring to Figs. 3A and 3B, a conventional LCD device assembly 110 includes an LCD panel 112, a back light device (not shown) for the LCD panel 112, and a display case 122 supporting an LCD module 111. The LCD panel 112 and the back light device are assembled by a metal sash 114 along the edges together with a plastic mold frame (not shown) supporting the back light device.

The display case 122 is coupled to a body 120 via a hinge mechanism 124, which may

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extend from the body 120. The display case 122 and the hinge mechanism 124 allow the LCD device assembly 110 to pivotally move with respect to the body 120.

Two opposite sides of the metal sash 114 include flanges 114a for assembling the LCD module 111 to the display case 122, and flanges 114b for assembling the LCD module
 5 111 to the hinge frame or hinge arm 126. Hereinafter, the former is referred as a fixing flange and the latter is referred as a mounting flange in this specification for distinction purposes. As shown in Fig. 3B, the fixing flanges 114a have a protruding width d2 and the mounting flanges 114b have a protruding width d1. A screw hole is formed in each of the flanges 114a and 114b. On the inner or bottom interior surface of the display case 122, ribs
 10 122a are formed corresponding to the holes of the fixing flange 114a.

To mount the LCD module 111, the hinge frame 126 and the mounting flanges 114b of the metal sash 114 are screwed together, and the fixing flanges 114a of the metal sash 114 and the ribs 122a are screwed together by bolts 128.

In the mounting structure shown in Fig. 3B, the metal sash or support frame 114
 15 requires side spaces for the flanges 114a and 114b. Therefore, the side space D ($d1 + d2$) results in a reduction of the ratio of the display area of the LCD panel 112 relative to the display case 122. Moreover, as the display panel size increases, the display case 122 becomes undesirably large, especially for a portable computer such as a laptop computer.

To solve the above problem, an assembling structure has been suggested, as shown in
 20 Fig. 4, which is a partial perspective view. The hinge arm or frame 126, the case 122 and the side wall portion of the display module 110 are screwed together by bolts 128. However, although the embodiment shown in Fig. 4 is a good solution, there may be some instances where it is desired to attach the hinge arm, the case and the side wall portion of the display module without using a screw hole in the side wall portion of the display module or to attach

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the hinge arm with the case (Fig. 3A).

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a portable computer that substantially
5 obviates one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention is to minimize the non-display area of the LCD
device.

Another object of the present invention is to provide a computer having a flat panel
display device with a maximum display area and a minimal display case size.

10 A further object of the present invention is to provide a firm mounting structure for a
flat panel display device on a computer.

Additional features and advantages of the invention will be set forth in the description
which follows, and in part will be apparent from the description, or may be learned by
practice of the invention. The objectives and other advantages of the invention will be
15 realized and attained by the structure particularly pointed out in the written description and
claims hereof as well as the appended drawings.

To achieve these and other advantages and the in accordance with the purpose of the
present invention, as embodied and broadly described, the present invention provides, in one
aspect, a computer including: a system body having an input device; a display module having
20 a display surface and a rear surface; a display case having a side wall surface; and a hinge
pivotally coupling the body to the display module, the hinge including a hinge frame having
first and second surfaces, the first surface coupled with the rear surface of the display
module, the second surface coupled with the side wall surface of the display case.

In another aspect, the present invention provides a portable computer including: a

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system body; a display module having a display surface and a side wall surface; a display case having an inner surface; and a hinge pivotally coupling the body to the display case, the hinge including a hinge frame having first and second surfaces, the first surface coupled with the inner surface of the display case, the second surface coupled with the side wall surface of the display module.

In another aspect, the present invention provides a computer including: a system body; a display module having a display surface; a display case having side walls, the display module secured between the side walls of the display case; and a hinge pivotally coupling the body to the display case, the hinge including a hinge frame coupled to the inner surface of the display case.

The present invention according to a first embodiment provides a method for mounting a display module in a portable computer including a system body, a display case having a side wall surface, a hinge having a hinge frame having first and second surfaces, the first surface being substantially parallel to a rear surface of the display module, the second surface being substantially parallel to the side wall surface of the display case, the hinge pivotally coupling the system body to the display case, the method comprising: arranging the hinge frame so that the first surface thereof is positioned between the display case and the rear surface of the display module, and so that the second surface thereof is positioned between the display module and the side wall surface of the display case; fastening the first surface of the hinge frame to the rear surface of the display module; and fastening the second surface of the hinge frame to the side wall surface of the display case.

The present invention according to a second embodiment provides a method for mounting a display module having a side wall surface in a portable computer including a system body, a display case having inner and side wall surfaces, a hinge having a hinge frame

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having first and second surfaces, the first surface being substantially parallel to a rear surface of the display module, the second surface being substantially parallel to the side wall surface of the display case, the hinge pivotally coupling the system body to the display case, the method comprising: arranging the hinge frame so that the first surface thereof is positioned

5 between the display case and the rear surface of the display module, and so that the second surface thereof is positioned between the display module and the side wall surface of the display case; fastening the first surface of the hinge frame to the inner surface of the display case; and fastening the second surface of the hinge frame to the side wall surface of the display module.

10 The present invention according to a second embodiment also provides a method for mounting a display module having a side wall surface in a portable computer including a system body, a display case having an inner and two side wall surfaces, a hinge having a hinge frame, the hinge pivotally coupling the system body to the display case, the method comprising: arranging the hinge frame so that a surface thereof is positioned between the

15 inner surface of the display case and the rear surface of the display module; fastening the surface of the hinge frame to the inner surface of the display case; and securing the display module between the side walls of the display case.

Preferably, the display module is a liquid crystal display device (LCD) module.

Preferably, the first and second surfaces of the hinge frame are substantially

20 perpendicular to each other.

Preferably, the first surface of the hinge frame has at least one fixing protrusion protruded toward the rear surface of the display module, and the rear surface of the display module has at least one fixing hole corresponding to the fixing protrusion of the first surface.

Preferably, the fixing protrusion is a fastener.

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Preferably, the second surface of the hinge frame is screw-coupled with the side wall surface of the display case.

Preferably, the hinge frame further has a third surface for supporting an edge of the display surface of the display module, and the third surface is substantially perpendicular to the second surface.

Preferably, the fixing protrusion is a fastener.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understand of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

Fig. 1 is a perspective view showing a general portable computer;

Fig. 2 shows a structure for mounting an LCD device for a portable computer;

Figs. 3A and 3B are a perspective view and a front view, respectively, showing a structure for mounting an LCD device for a portable computer;

Fig. 4 is a partial view showing another mounting structure of the LCD device for a conventional portable computer;

Fig. 5 is an exploded perspective view illustrating a structure for mounting a liquid

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crystal display module of a portable computer according to a first embodiment of the present invention;

Fig. 6 is a bottom view illustrating a rear surface of a liquid crystal display module of a portable computer according to the first embodiment of the present invention;

5 Fig. 7 is a partially exploded perspective view illustrating a structure for mounting a liquid crystal display module of a portable computer according to a first embodiment of the present invention;

10 Fig. 8 is a partially exploded perspective view illustrating a modification of a structure for mounting a liquid crystal display module of a portable computer according to a first embodiment of the present invention;

Fig. 9 is a partially exploded perspective view illustrating another modification of a structure for mounting a liquid crystal display module of a portable computer according to a first embodiment of the present invention;

15 Figs. 10A, 10B and 10C are partially exploded perspective views illustrating various modifications of a structure for mounting a liquid crystal display module of a portable computer according to a first embodiment of the present invention

Fig. 11 is an exploded perspective view illustrating a liquid crystal display module according to a second embodiment according to the invention;

20 Fig. 12 is a partially exploded perspective view illustrating a structure for mounting a liquid crystal display module of a portable computer according to a second embodiment of the present invention; and

Fig. 13 is a partially exploded perspective view illustrating another structure for mounting a liquid crystal display module of a portable computer according to a second embodiment of the present invention.

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DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference will now be made in detail to the preferred embodiments of the present invention, an example of which is illustrated in the accompanying drawings.

5 Referring Figs. 5 and 6, which show a first embodiment, a display module 10 (which may be a liquid crystal display module) has a display panel 12 and a back light device 14, both of which are assembled to each other by first and second frames 16a and 16b. The back light device 14 comprises a reflective plate 14a, a wave guide plate 14b, a first diffuser/protecting sheet 14c, a first prism sheet 14d, a second prism sheet 14e, and a second
10 diffuser/protecting sheet 14f, which are layered in this order. The display panel 12 and the back light device 14 are supported by first and second frames 16a and 16b, and the second frame 16b has a fixing hole 15. As shown in Fig. 5, a plurality of fixing holes 15 are preferably arranged at each corner of the display module 10. The fixing holes 15 may have the shape of a rib, if necessary.

15 Fig. 7 is a partially exploded perspective view illustrating structure for mounting a liquid crystal display module of a portable computer according to a first.

A hinge mount 40 is positioned at a protruded portion of a system body 50 such that a display assembly having the display module 10 and the display case 30 pivotally moves with respect to the body 50. A hinge frame 20 is positioned on an inner, or bottom interior, surface
20 of the display case 30. The hinge frame 20 is comprised of a pin portion 20a at its one end, which is inserted into the hinge mount 40, and a "L"-shaped portion 20b which has first and second surfaces 21 and 22. The first surface 21 is parallel to a rear surface of the display module 10, and the second surface 22 is parallel to a side wall surface of the display module

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10. The pin portion 20a can be coupled to the L-shaped portion 20b or be integrally formed with the L-shaped portion 20b. The hinge frame 20 also extends along the side wall surface of the display module 10. The first surface 21 has at least one fixing protrusion 27 corresponding to the fixing holes 15 of the rear surface of the display module 10, and the
 5 second surface 22 has at least one hole 28 corresponding to the through holes 31 of the side wall surface of the display case 30.

A preferred method for mounting the display module 10 according to the first embodiment is explained hereinafter. The fixing protrusion 27 of the second surface 22 of the L-shaped portion 20b of the hinge frame 20 is inserted into the fixing holes 15 of the display
 10 module 10 such that the display module 10 is secured. Then a coupling member 18 such as a screw and a nail passes through the hole 28 of the second surface 22 and the through hole 31 of the display case 30 such that the hinge frame 20 is fixed to the display case 30.

Also, the fixing protrusion 27 preferably has the shape of a plastic hook or a fastener for firmly holding the display module 10, and an inlet portion of the fixing hole 15 is
 15 preferably narrower than an interior portion of the fixing hole 15.

To provide a more shockproof and shake-proof mounting structure, the hinge frame 20 can have the shape of "C" as shown in Fig. 8. That is, the hinge frame 20 further has a third surface 23 to support both upper edges of opposing sides of the display module 10 parallel to the hinge frame 20. The first and third surfaces 21 and 23 can be integrally formed
 20 with the second surface 22, or can be attachable brackets.

Fig. 9 shows another modification of the first embodiment.

The hinge frame 20 can have a reverse "F" shaped first surface 21 to hold the display module 10, instead of a long elongated first surface 21 (see Fig. 7).

Figs. 10A, 10B and 10C are other modifications of a mounting structure according to

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the first embodiment.

The hinge frames 20a, 20b and 20c may have various shapes of first surfaces 21 to enhance a fixing force of a display module 10.

Fig. 11 illustrates a second embodiment, wherein the structure of the display module 10 is similar to that shown in Fig. 5, and therefore, the explanation thereof is not repeated here. However, the display module 10 has a plurality of fixing holes 19 on the side wall surface thereof other than the rear surface thereof. The fixing holes 19 are for a side mounting method wherein the side wall of the display module 10 is coupled to a hinge frame or to the case. That is, the display module 10 can be assembled to the hinge frame 20 (see Fig. 7) not to the case 30 (see Fig. 7). It is also possible that the display module 10 is assembled to the case 30 directly, without engaging the hinge frame 20 therebetween.

Fig. 12 shows an exemplary mounting structure wherein the hinge frame is assembled to the inner, or bottom interior, surface of the case 30 and the display module 10 is mounted inside of the case 30. Preferably, the hinge frame 20 has an "L" shape and has a first surface 21 contacting with the rear surface of display module 10 and a second surface 22 contacting with the side wall surface of the display module 10. The display case 30 has a plurality of screw holes (not shown) on the inner surface thereof, and the first surface 21 of the hinge frame 20 has a plurality of screw holes 25 corresponding to the screw holes of the display case 30. Further, the second surface 21 of the hinge frame 20 preferably has a plurality of screw holes 26 corresponding to the screw holes 19 of the side wall surface of the display module 10. Thus, the first surface 21 of the hinge frame 20 is coupled with the display case 30, and the second surface 22 of the hinge frame 20 is coupled with the display module 10.

Fig. 13 shows another exemplary mounting structure of the second embodiment. The structure of Fig. 13 also shows a mounting structure wherein the hinge frame 20 is assembled

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to the inner surface of the case 30.

The first surface 21 of the hinge frame 20 has a plurality of plastic hooks or fasteners protruded toward the inner surface of the case 30, and the display case 30 has a plurality of fastener fixing holes 19a corresponding to the fastener, thereby the first surface 21 of the
5 hinge frame 20 is coupled with the display case 30 by pressing the first surface 21 without tightening a screw.

In the second embodiment, instead of a screw and fastener, a nail can be employed. Further, the hinge frame may be "C" shaped, and a bracket having a long length may be used instead of the hinge frame integrally formed with the pin portion. The hinge frame may have
10 a short length.

As described until here, using the mounting structure according to the invention, the display area is maximized, and a more shock-proof display assembly is provided. Further, the mounting structure according to one embodiment of the invention has an advantage that the display assembly can be assembled to the case without tightening a screw into the side wall
15 surface of the display module. The invention also shows that the hinge frame of the invention can be assembled to a rear surface of the display module or to an inner surface of the case.

Other embodiments of the invention will be apparent to the skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with the true scope and
20 spirit of the invention being indicated by the following claims.

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WHAT IS CLAIMED IS:

- 1 1. A portable computer, comprising:
 - 2 a system body having an input device;
 - 3 a display module having a display surface and a rear surface;
 - 4 a display case having a side wall surface; and
 - 5 a hinge pivotally coupling the system body to the display module, the hinge including
 - 6 a hinge frame having first and second surfaces, the first surface coupled with the rear surface
 - 7 of the display module, the second surface coupled with the side wall surface of the display
 - 8 case.
- 1 2. The computer of claim 1, wherein the display module is a liquid crystal display (LCD)
- 2 module.
- 1 3. The computer of claim 2, wherein the first and second surfaces of the hinge frame are
- 2 substantially perpendicular to each other.
- 1 4. The computer of claim 2, wherein the first surface of the hinge frame has at least one
- 2 fixing protrusion protruded toward the rear surface of the display module, and the rear
- 3 surface of the display module has at least one fixing hole corresponding to the fixing
- 4 protrusion of the first surface.
- 1 5. The computer of claim 4, wherein the fixing protrusion is a fastener.
- 1 6. The computer of claim 4, wherein the second surface of the hinge frame is screw-coupled

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2 with the side wall surface of the display case.

1 7. The computer of claim 2, wherein the hinge frame further has a third surface for
2 supporting an edge of the display surface of the display module, and the third surface is
3 substantially perpendicular to the second surface.

1 8. A portable computer, comprising:
2 a system body;
3 a display module having a display surface and a side wall surface;
4 a display case having an inner surface; and
5 a hinge pivotally coupling the system body to the display case, the hinge including a
6 hinge frame having first and second surfaces, the first surface coupled with the inner surface
7 of the display case, the second surface coupled with the side wall surface of the display
8 module.

1 9. The computer of claim 8, wherein the display module is a liquid crystal display (LCD)
2 module.

1 10. The computer of claim 9, wherein the first surface of the hinge frame is screw-coupled
2 with the inner surface of the display case, and the second surface of the hinge frame is screw-
3 coupled with the side wall surface of the display module.

1 11. The computer of claim 9, wherein the first surface of the hinge frame has at least one
2 fixing protrusion protruded toward the inner surface of the display case, and the inner surface

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3 has at least one fixing hole corresponding to the fixing protrusion of the first surface.

1 12. The computer of claim 11, wherein the fixing protrusion is a fastener.

1 13. A computer, comprising:

2 a system body;

3 a display module having a display surface;

4 a display case having side walls, the display module secured between the side walls of
5 the display case; and

6 a hinge pivotally coupling the body to the display case, the hinge including a hinge
7 frame coupled to the inner surface of the display case.

1 14. The computer of claim 13, wherein the display module is a liquid crystal display (LCD)
2 module.

1 15. The computer of claim 14, wherein the hinge frame is screw-coupled with the inner
2 surface of the display case.

1 16. The computer of claim 14, wherein the hinge frame has at least one fixing protrusion
2 protruded toward the inner surface of the display case, and the inner surface has at least one
3 fixing hole corresponding to the fixing protrusion of the hinge frame.

1 17. The computer of claim 16, wherein the fixing protrusion is a fastener.

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1 18. A method for mounting a display module in a portable computer including a system
2 body, a display case having a side wall surface, a hinge having a hinge frame having first and
3 second surfaces, the first surface being substantially parallel to a rear surface of the display
4 module, the second surface being substantially parallel to the side wall surface of the display
5 case, the hinge pivotally coupling the system body to the display case, the method
6 comprising:

7 arranging the hinge frame so that the first surface thereof is positioned between the
8 display case and the rear surface of the display module, and so that the second surface thereof
9 is positioned between the display module and the side wall surface of the display case;

10 fastening the first surface of the hinge frame to the rear surface of the display module;

11 and

12 fastening the second surface of the hinge frame to the side wall surface of the display
13 case.

1 19. The method of claim 18, wherein the display module is a liquid crystal display (LCD)
2 module.

1 20. The method of claim 18, wherein the first surface of the hinge frame has at least one
2 fixing protrusion protruded toward the rear surface of the display module, and the rear
3 surface of the display module has at least one fixing hole corresponding to the fixing
4 protrusion of the first surface of the hinge frame.

1 21. The method of claim 18, wherein the first surface of the hinge frame is screw-coupled
2 with the rear surface of the display module.

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1 22. The method of claim 18, wherein the second surface of the hinge frame is screw-coupled
2 with the side wall surface of the display case.

1 23. A method for mounting a display module having a side wall surface in a portable
2 computer including a system body, a display case having inner and side wall surfaces, a hinge
3 having a hinge frame having first and second surfaces, the first surface being substantially
4 parallel to a rear surface of the display module, the second surface being substantially parallel
5 to the side wall surface of the display case, the hinge pivotally coupling the system body to
6 the display case, the method comprising:

7 arranging the hinge frame so that the first surface thereof is positioned between the
8 display case and the rear surface of the display module, and so that the second surface thereof
9 is positioned between the display module and the side wall surface of the display case;

10 fastening the first surface of the hinge frame to the inner surface of the display case;

11 and

12 fastening the second surface of the hinge frame to the side wall surface of the display
13 module.

1 24. The method of claim 23, wherein the display module is a liquid crystal display (LCD)
2 module.

1 25. The method of claim 23, wherein the first surface of the hinge frame is screw-coupled
2 with the inner surface of the display case.

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1 26. The method of claim 23, wherein the second surface of the hinge frame is screw-coupled
2 with the side wall surface of the display module.

1 27. The method of claim 23, wherein the first surface of the hinge frame is coupled to the
2 inner surface of the display case by a fastener.

1 28. A method for mounting a display module having a side wall surface in a portable
2 computer including a system body, a display case having an inner and two side wall surfaces,
3 a hinge having a hinge frame, the hinge pivotally coupling the system body to the display
4 case, the method comprising:

5 arranging the hinge frame so that a surface thereof is positioned between the inner
6 surface of the display case and the rear surface of the display module;

7 fastening the surface of the hinge frame to the inner surface of the display case; and

8 securing the display module between the side walls of the display case.

1 29. The method of claim 28, wherein the display module is a liquid crystal display (LCD)
2 module.

1 30. The method of claim 28, wherein the surface of the hinge frame is screw-coupled with the
2 inner surface of the display case.

1 31. The method of claim 28, wherein the surface of the hinge frame is coupled to the inner
2 surface of the display case by a fastener.

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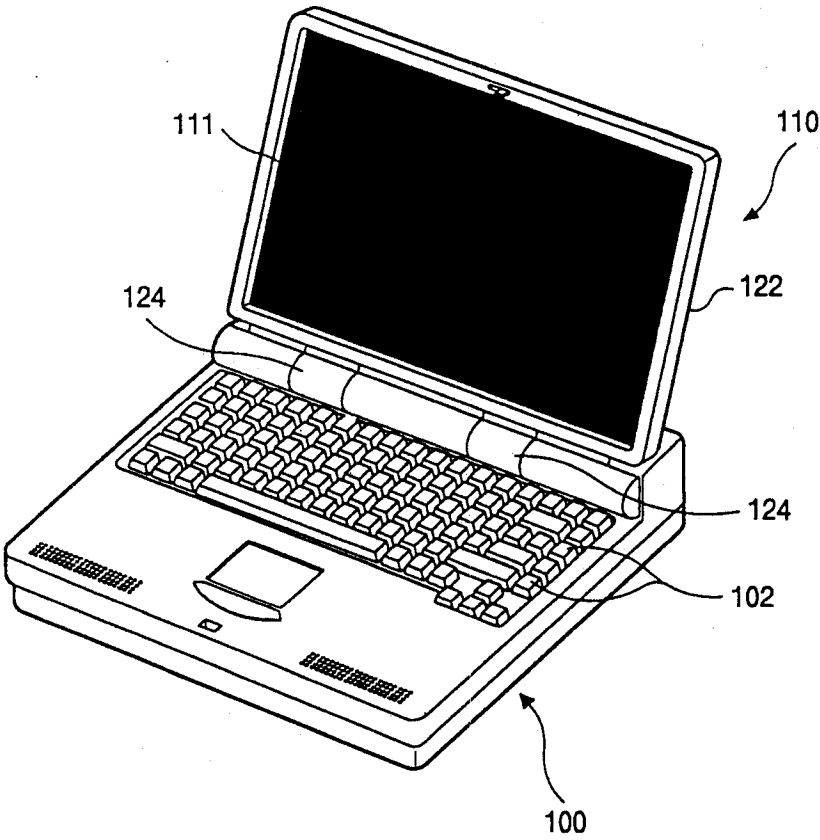


FIG. 1

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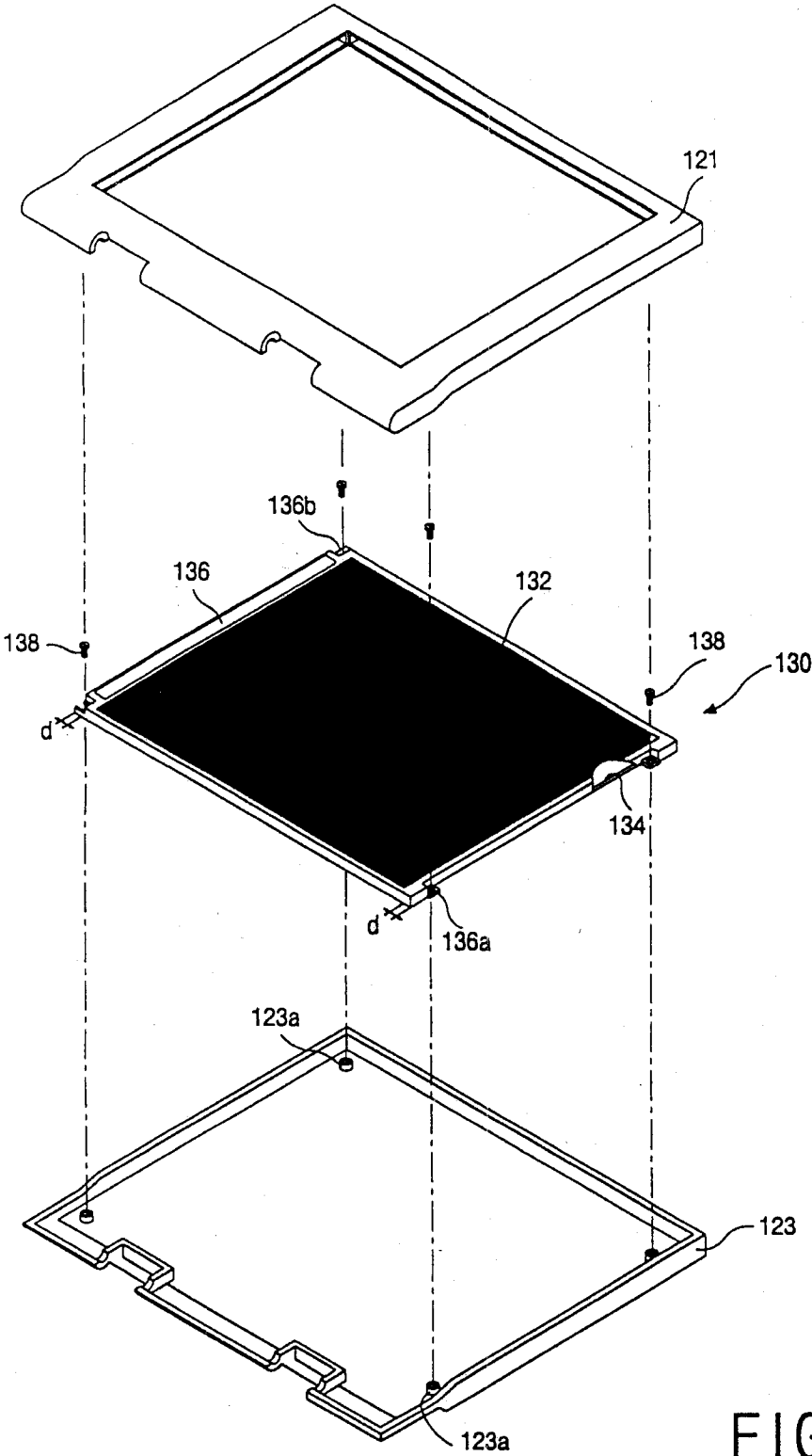


FIG. 2

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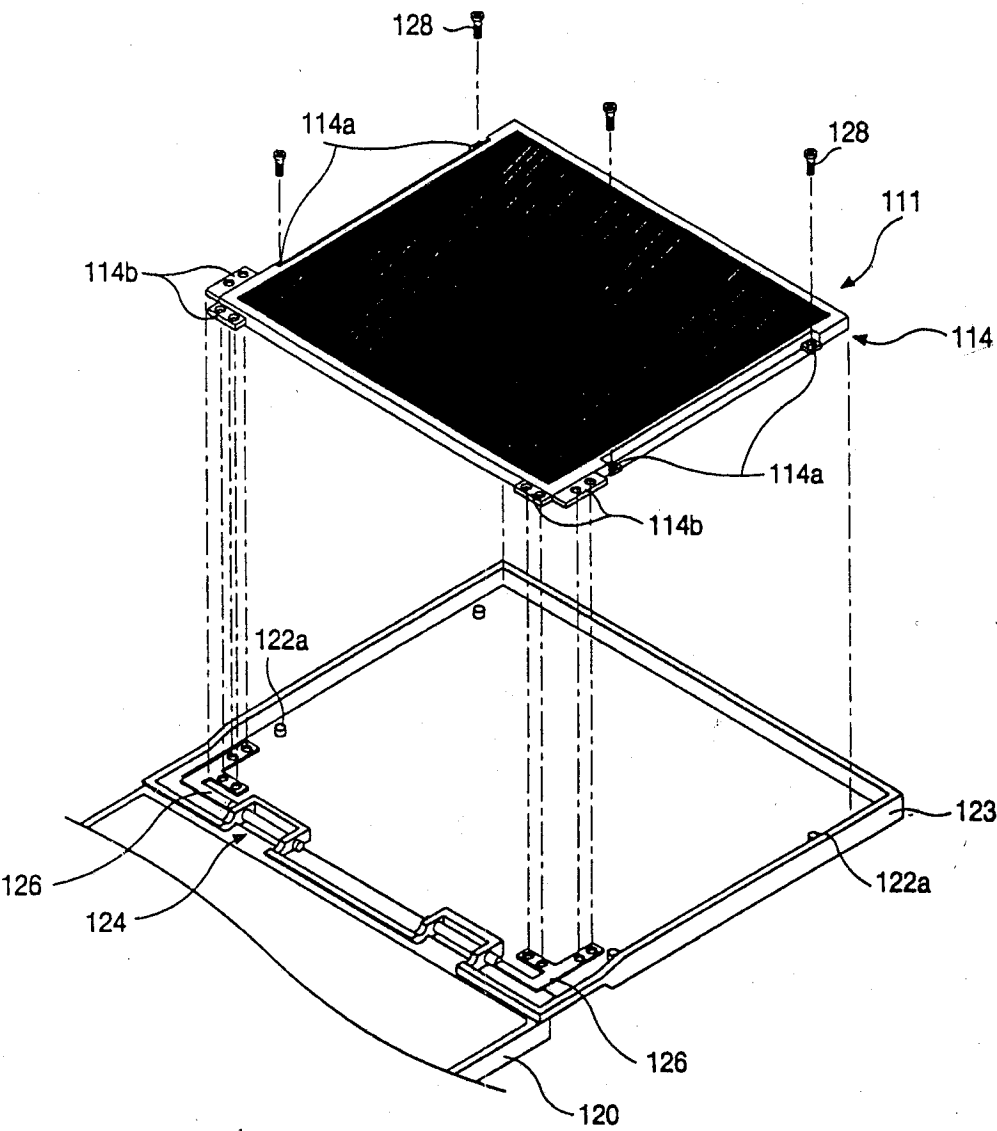


FIG. 3A

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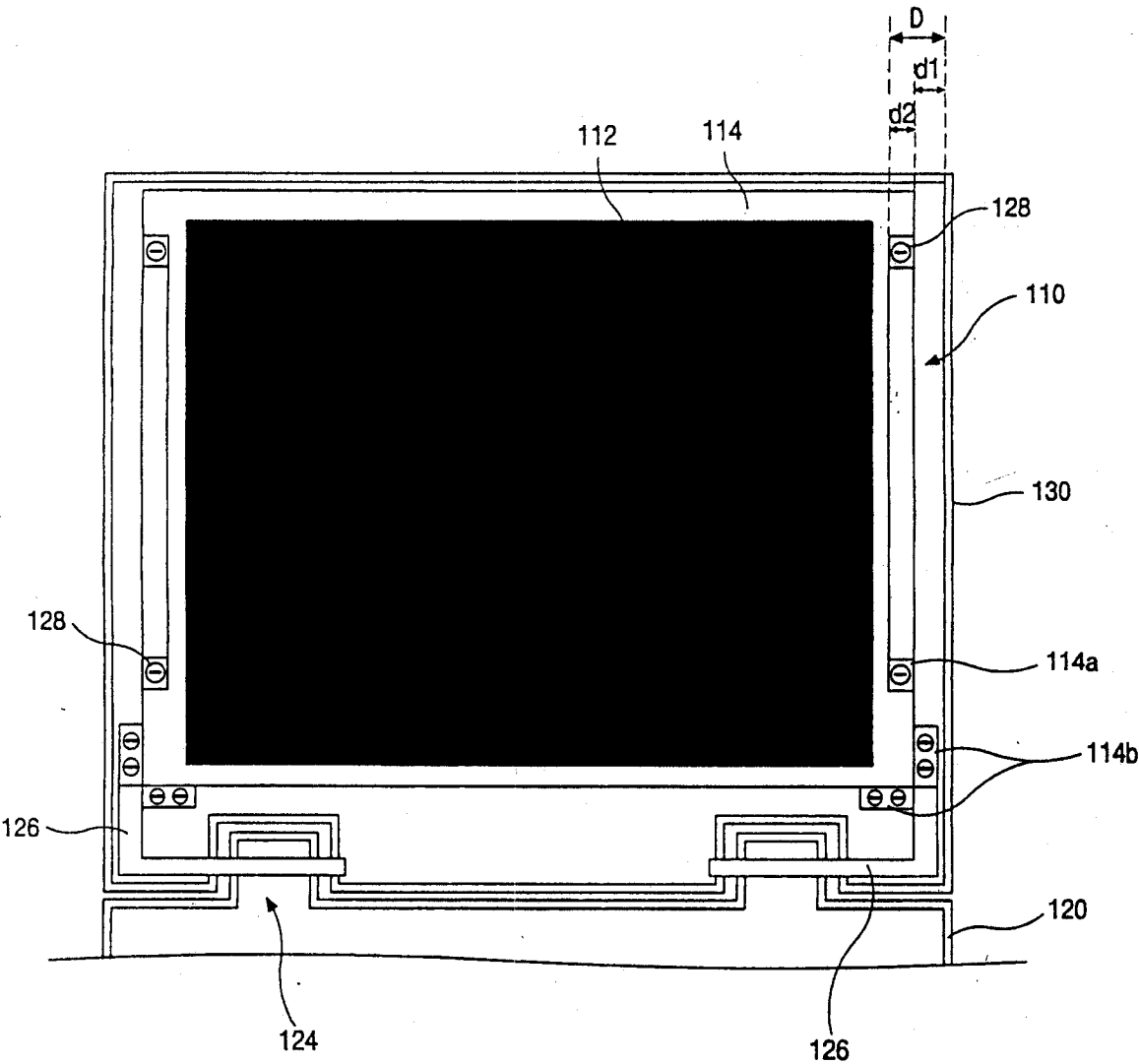


FIG. 3B

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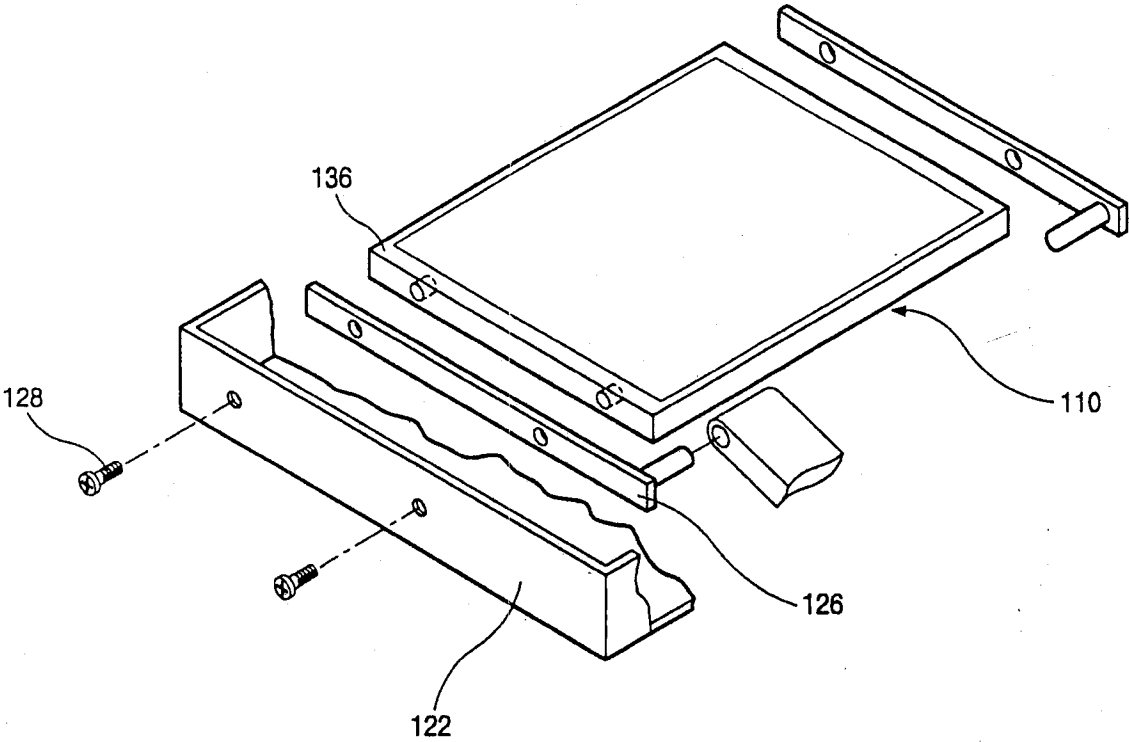
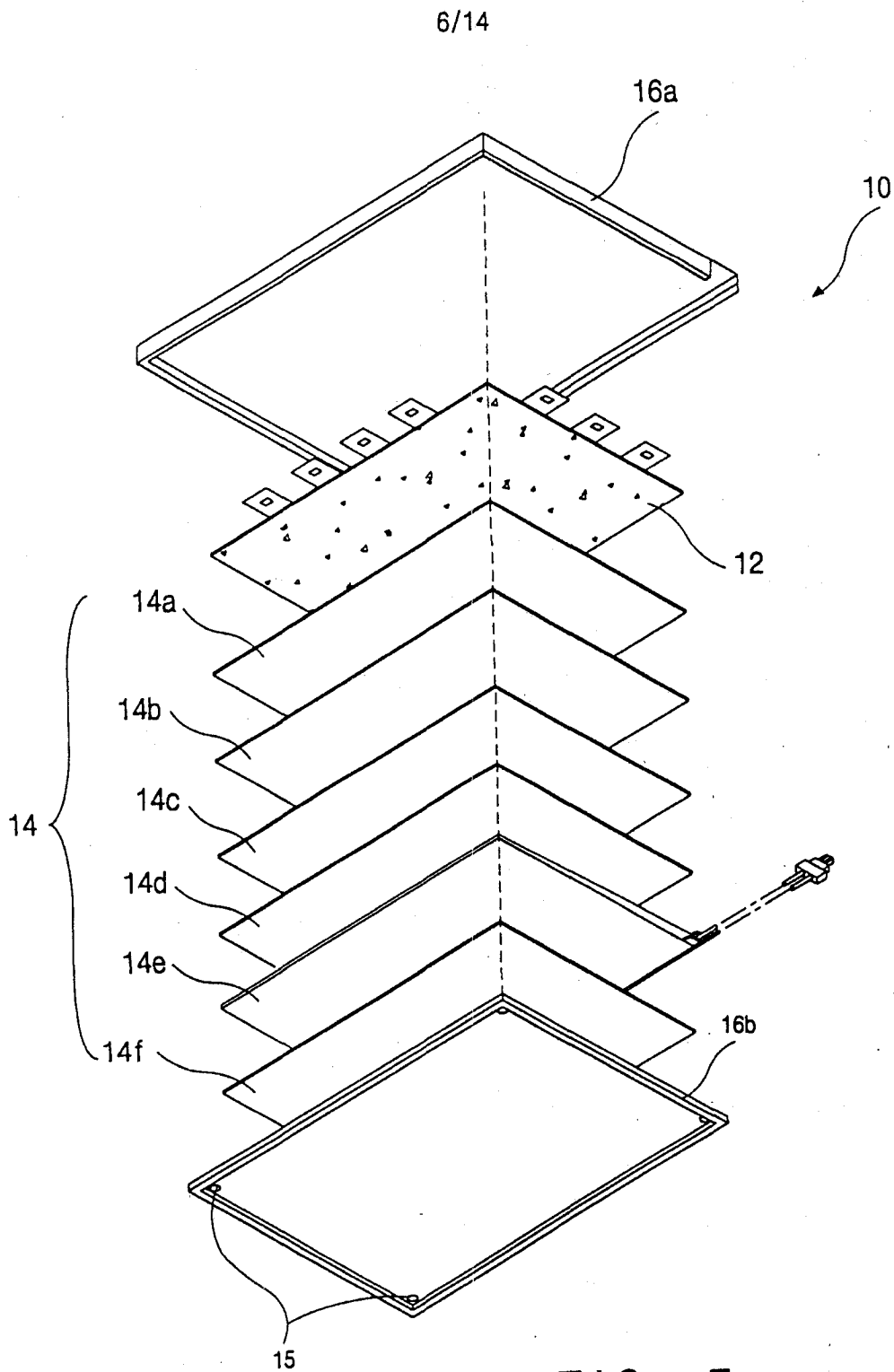


FIG. 4

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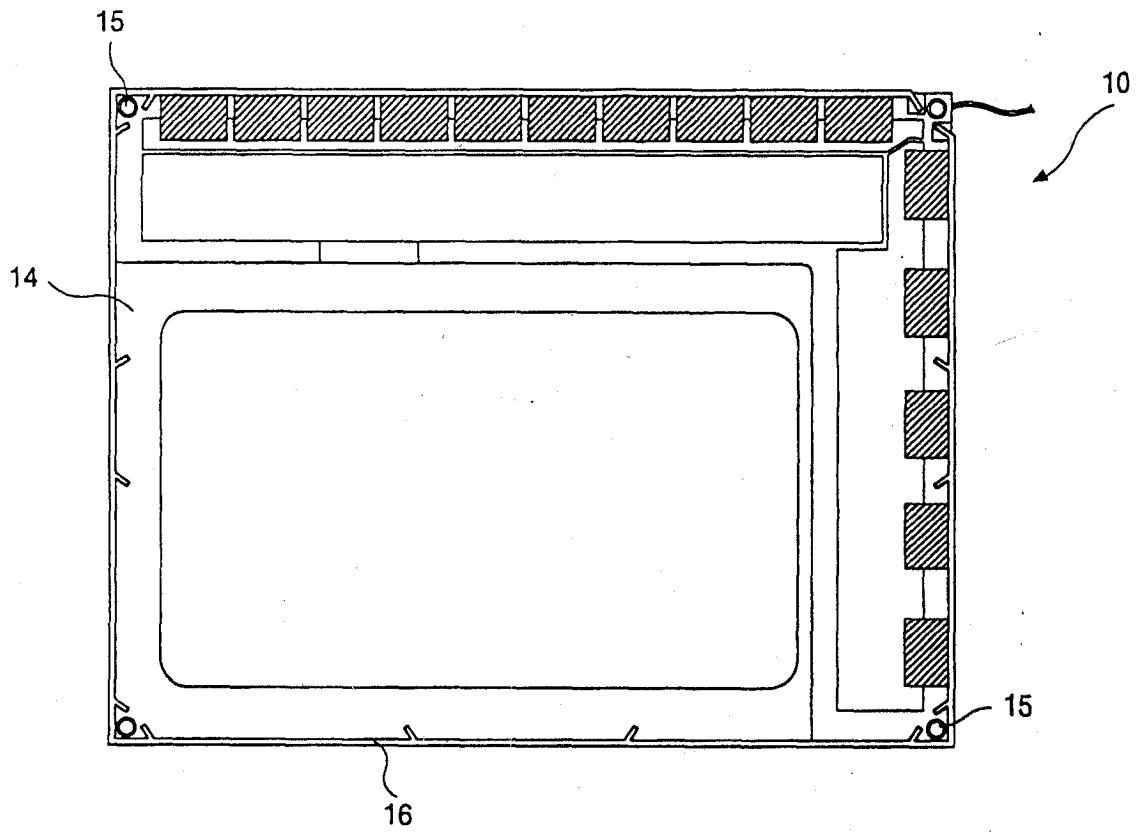


FIG. 6

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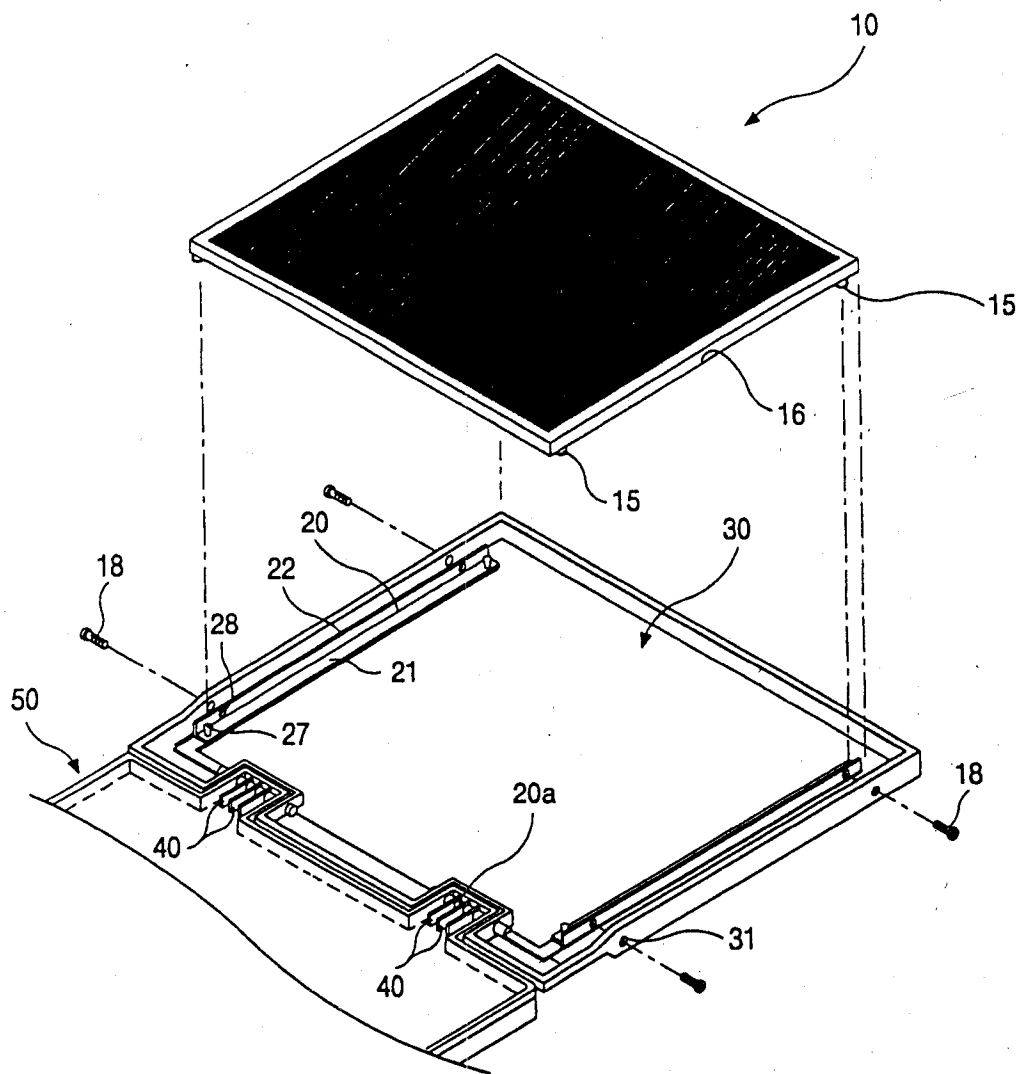


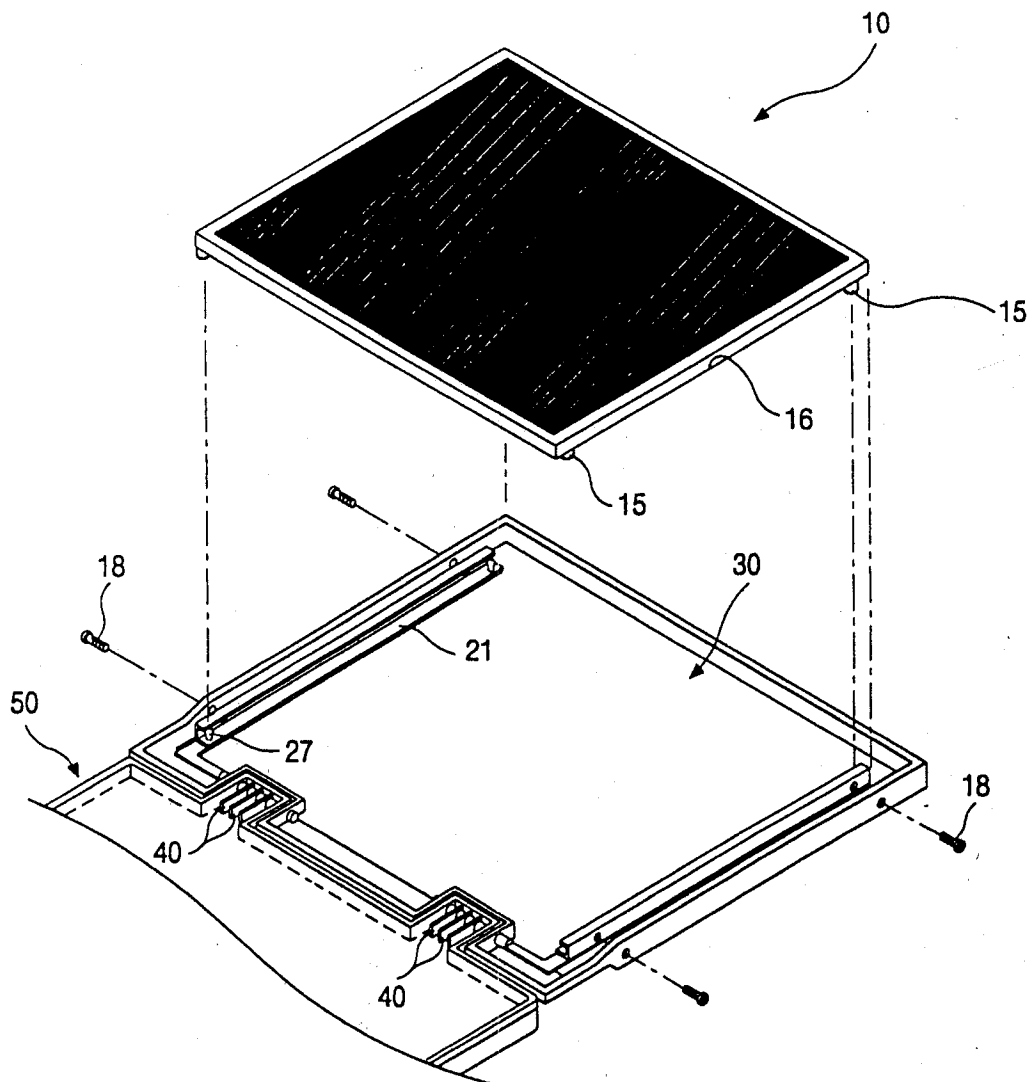
FIG. 7

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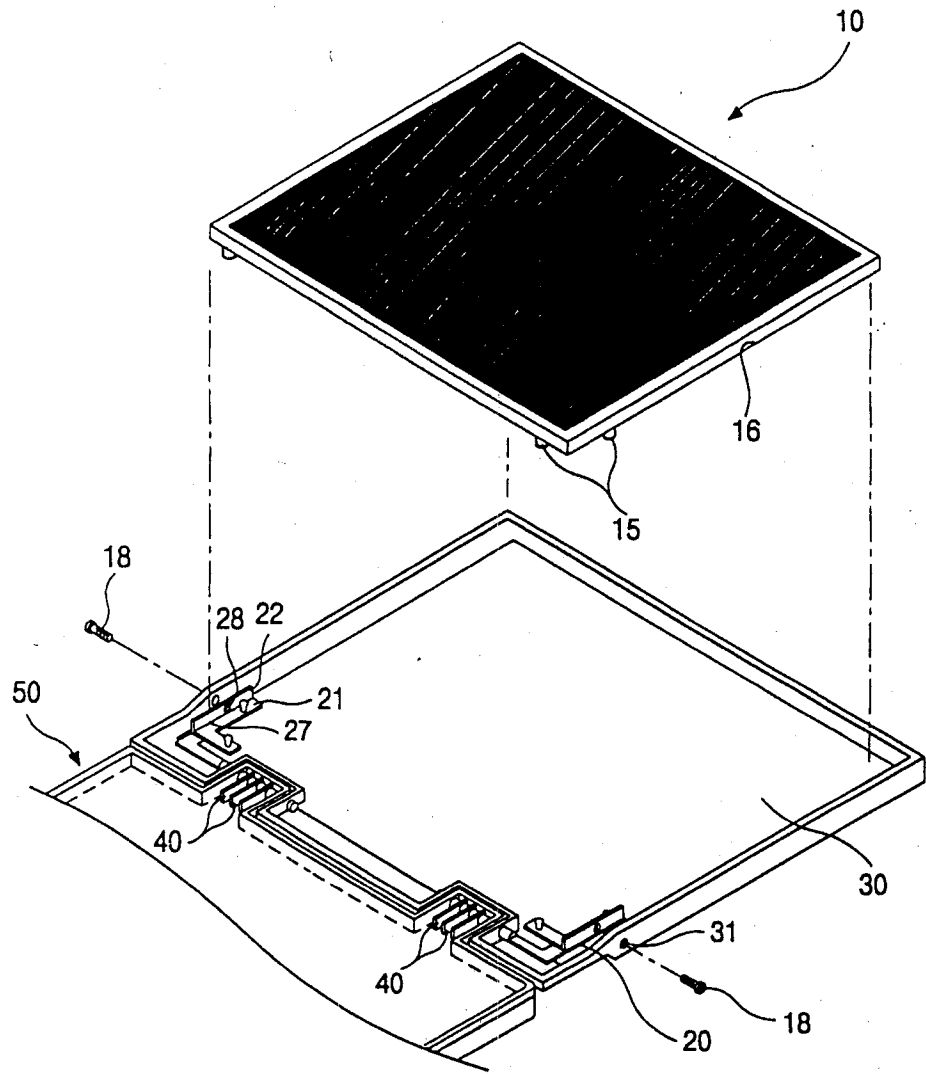


FIG. 9

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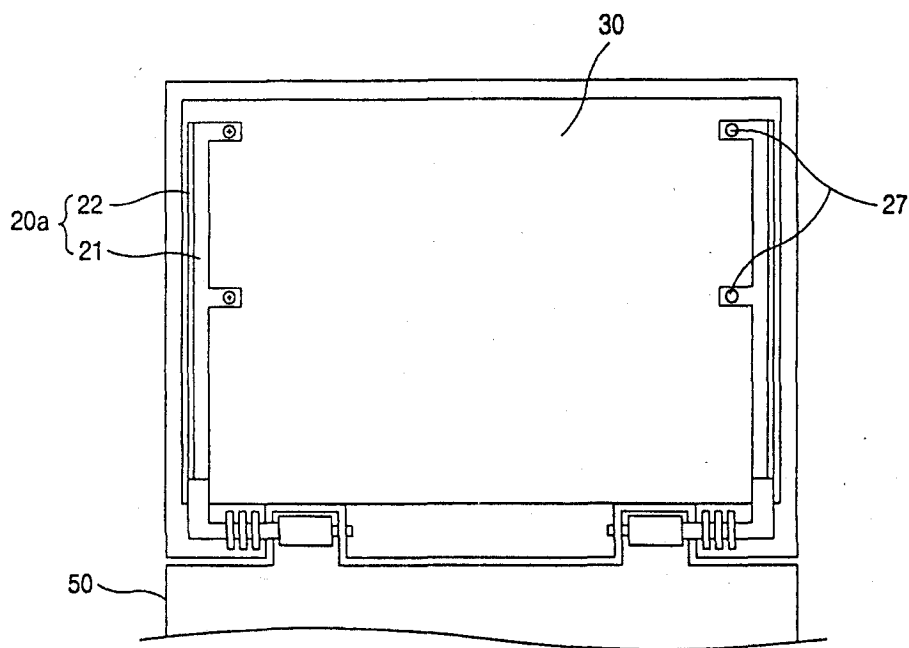


FIG. 10a

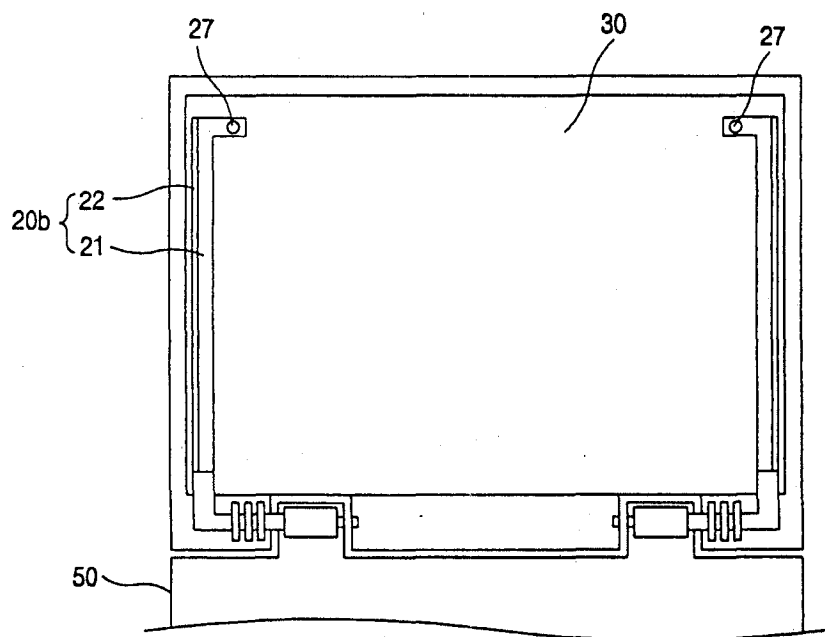


FIG. 10b

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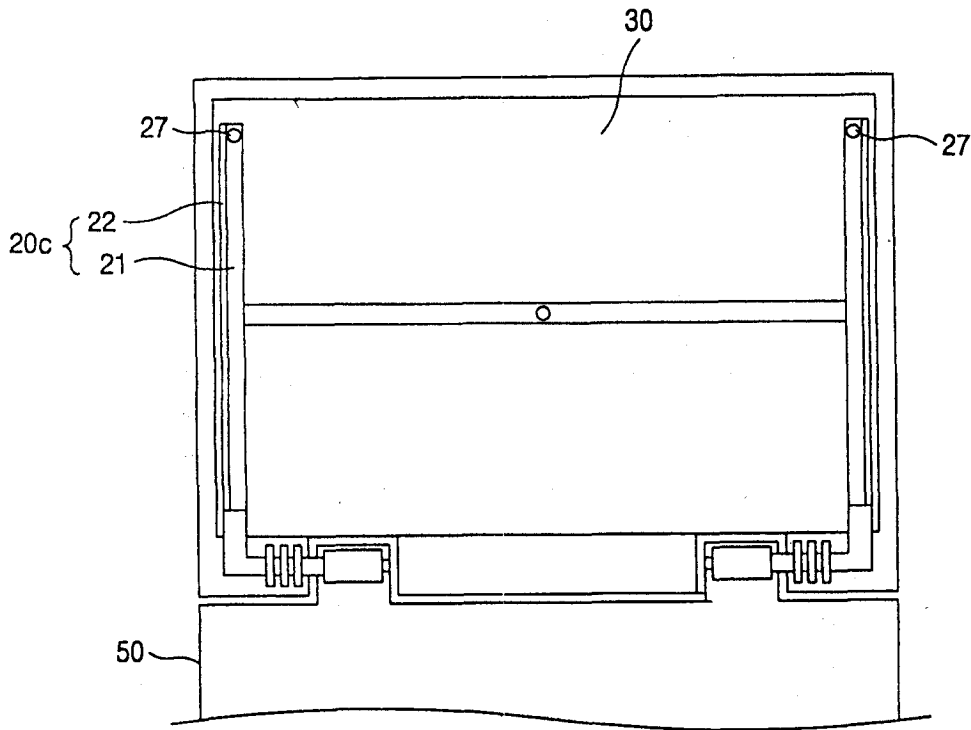


FIG. 10c

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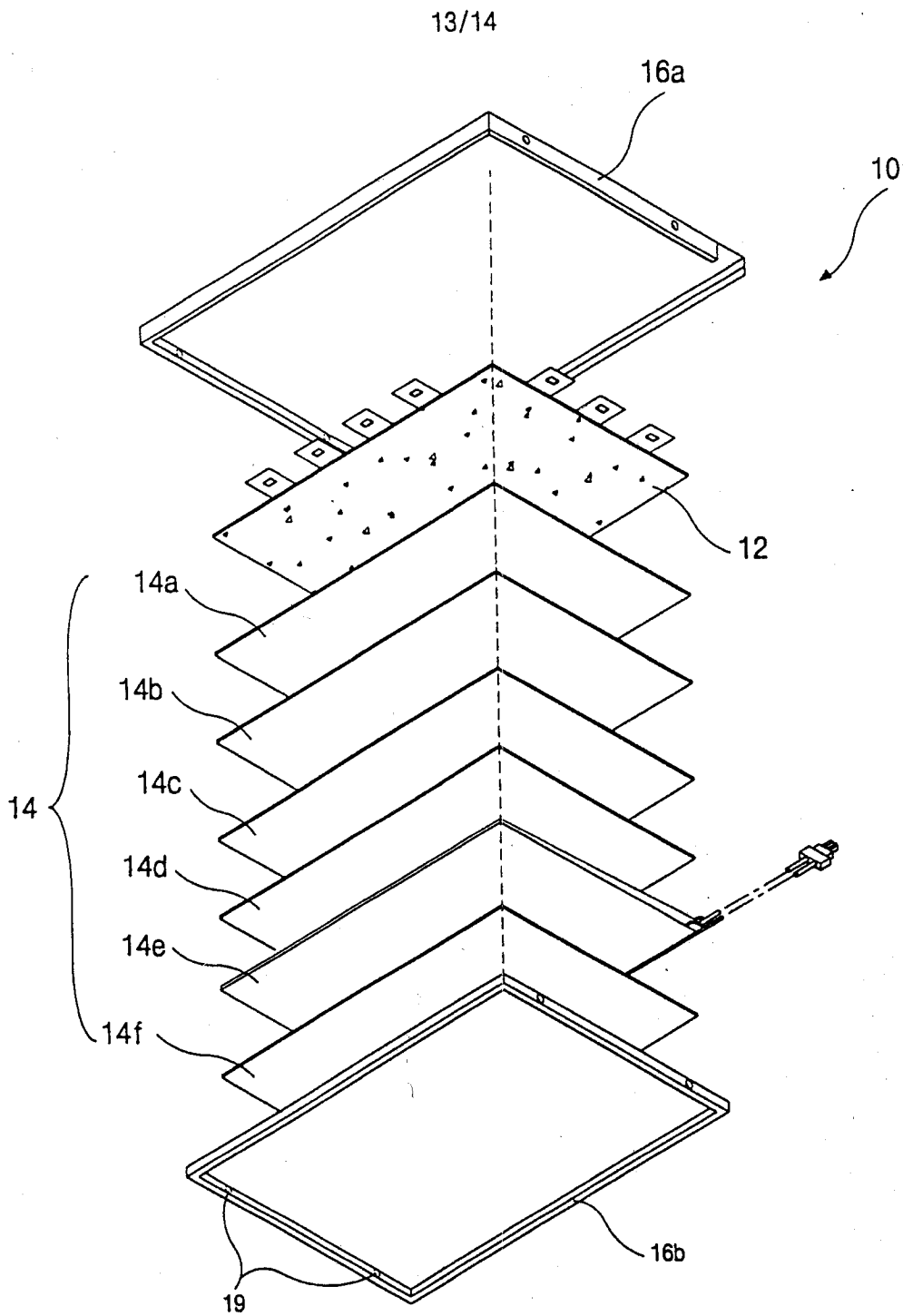


FIG. 11

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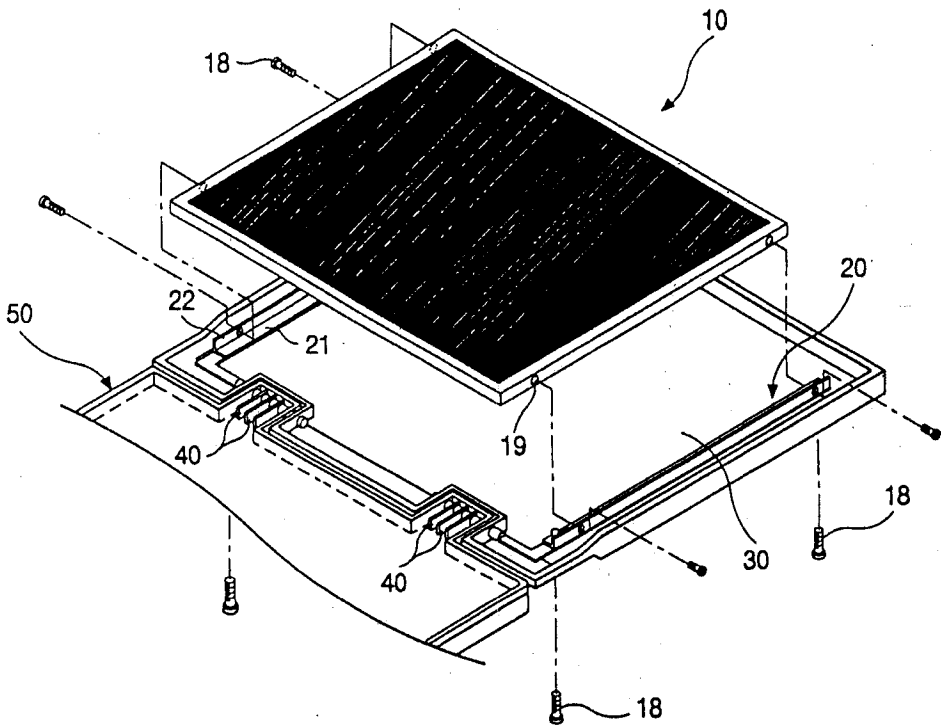


FIG. 12

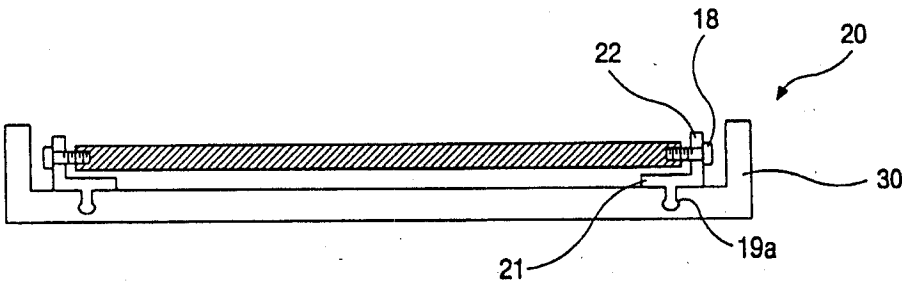


FIG. 13

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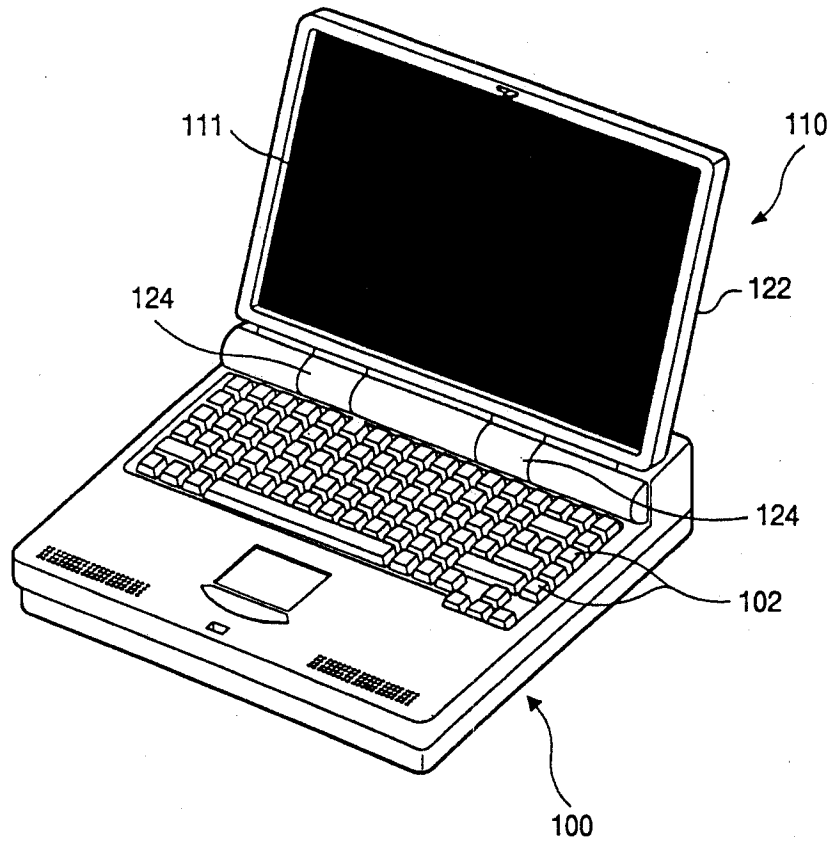


FIG. 1

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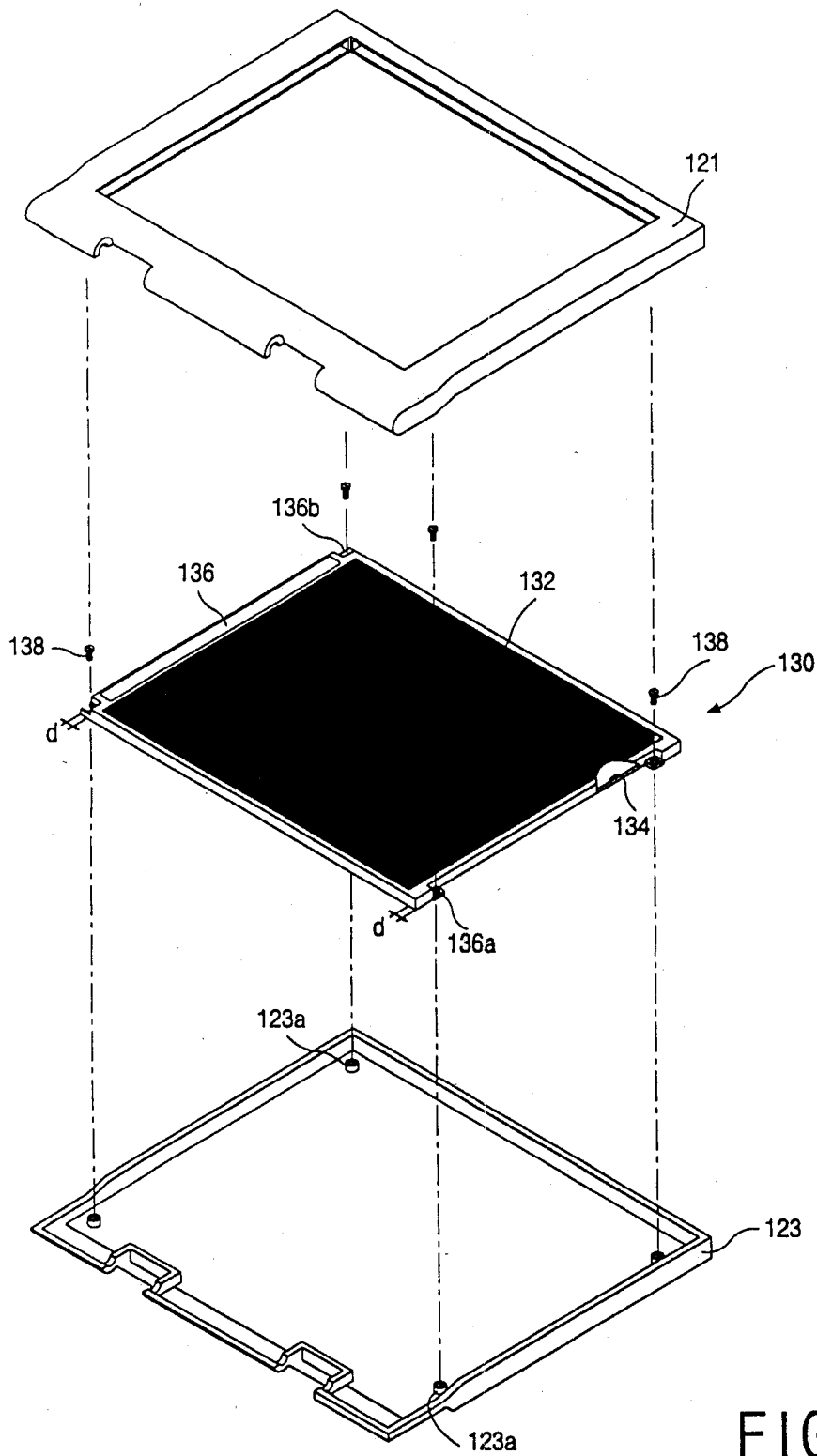


FIG. 2

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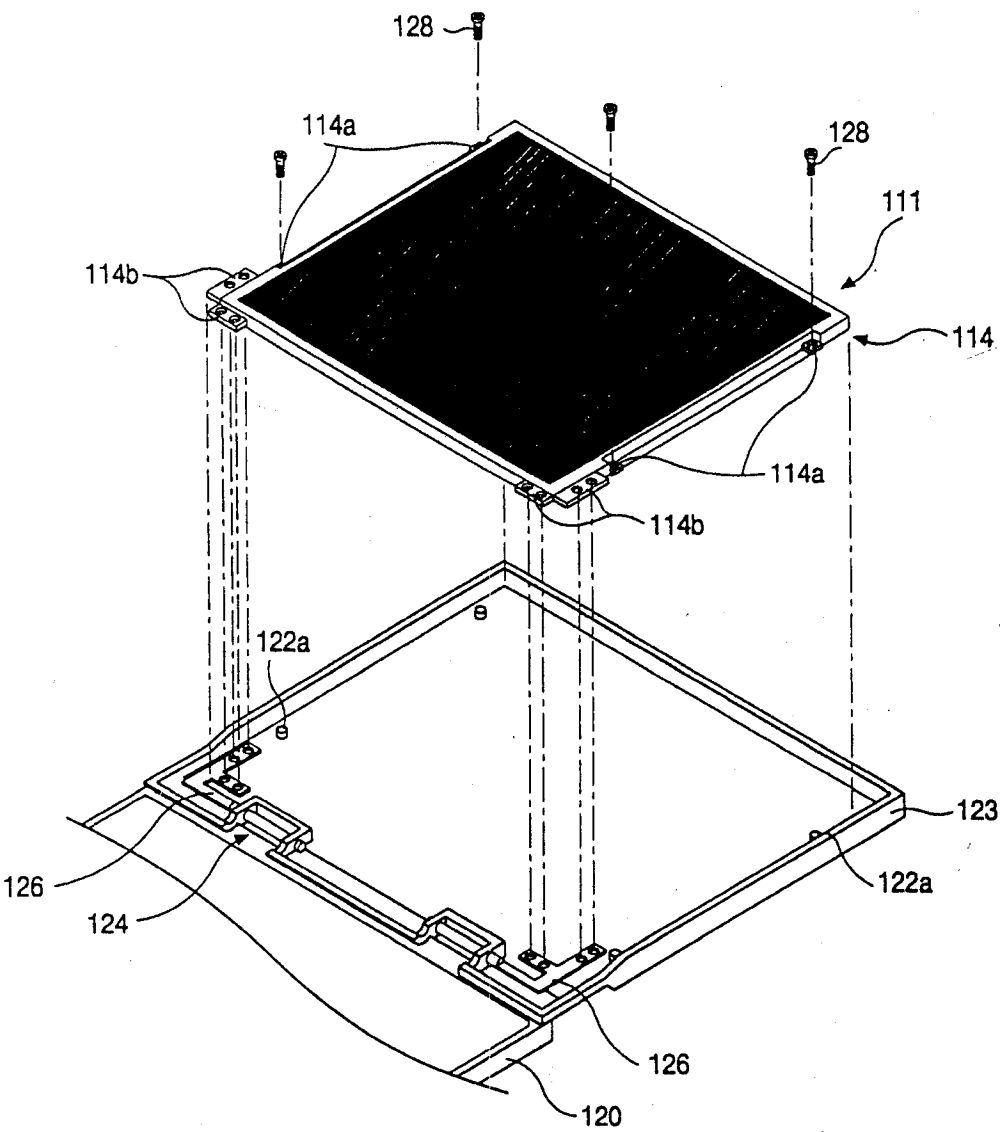


FIG. 3A

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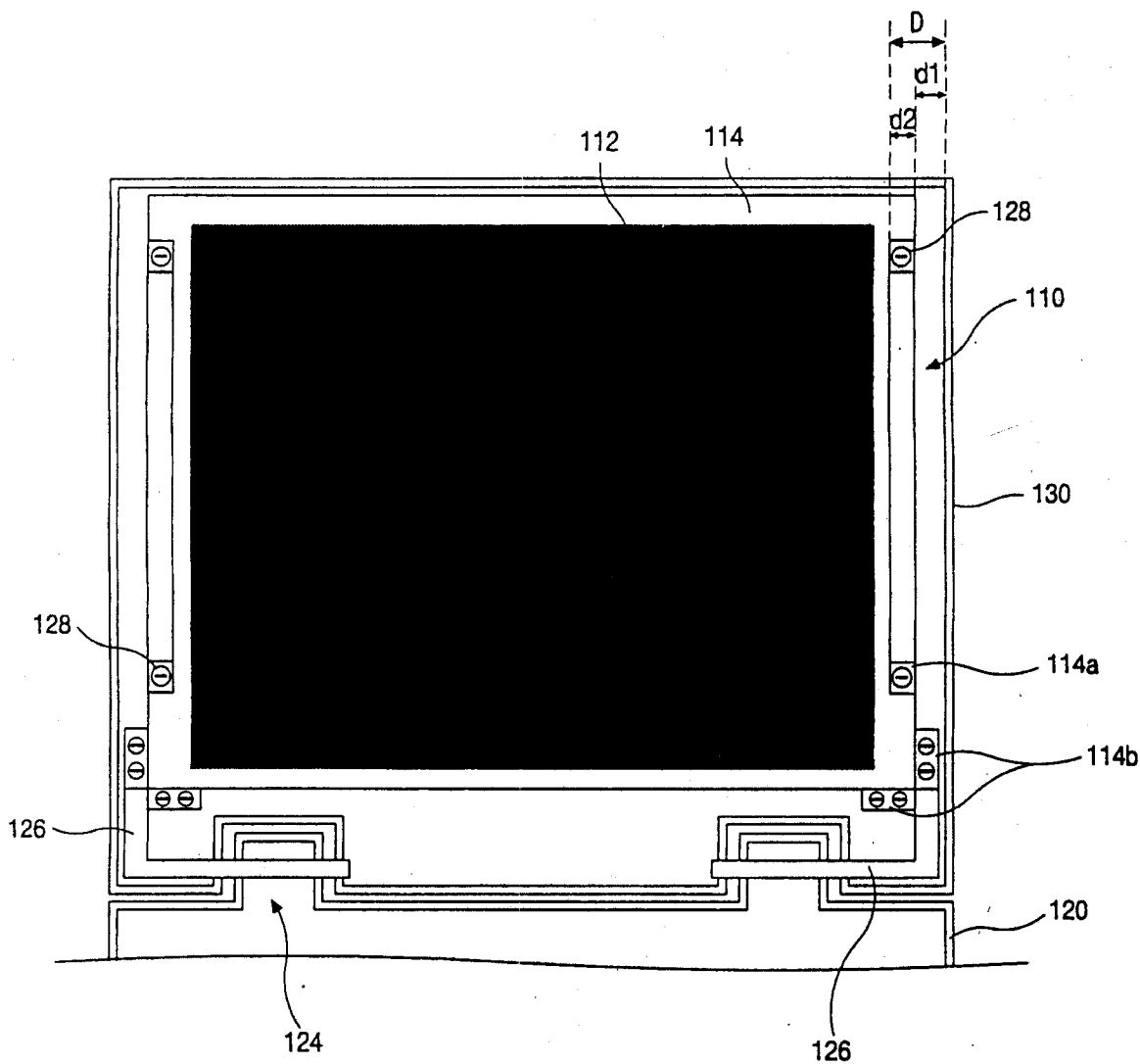


FIG. 3B

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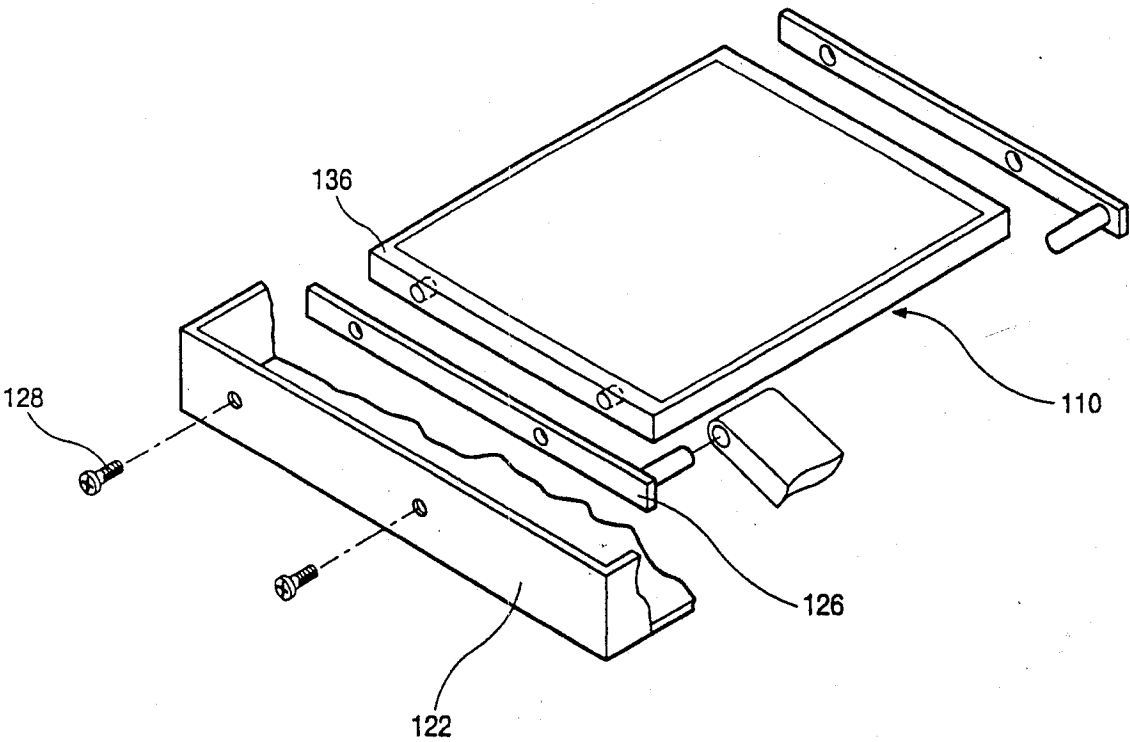


FIG. 4

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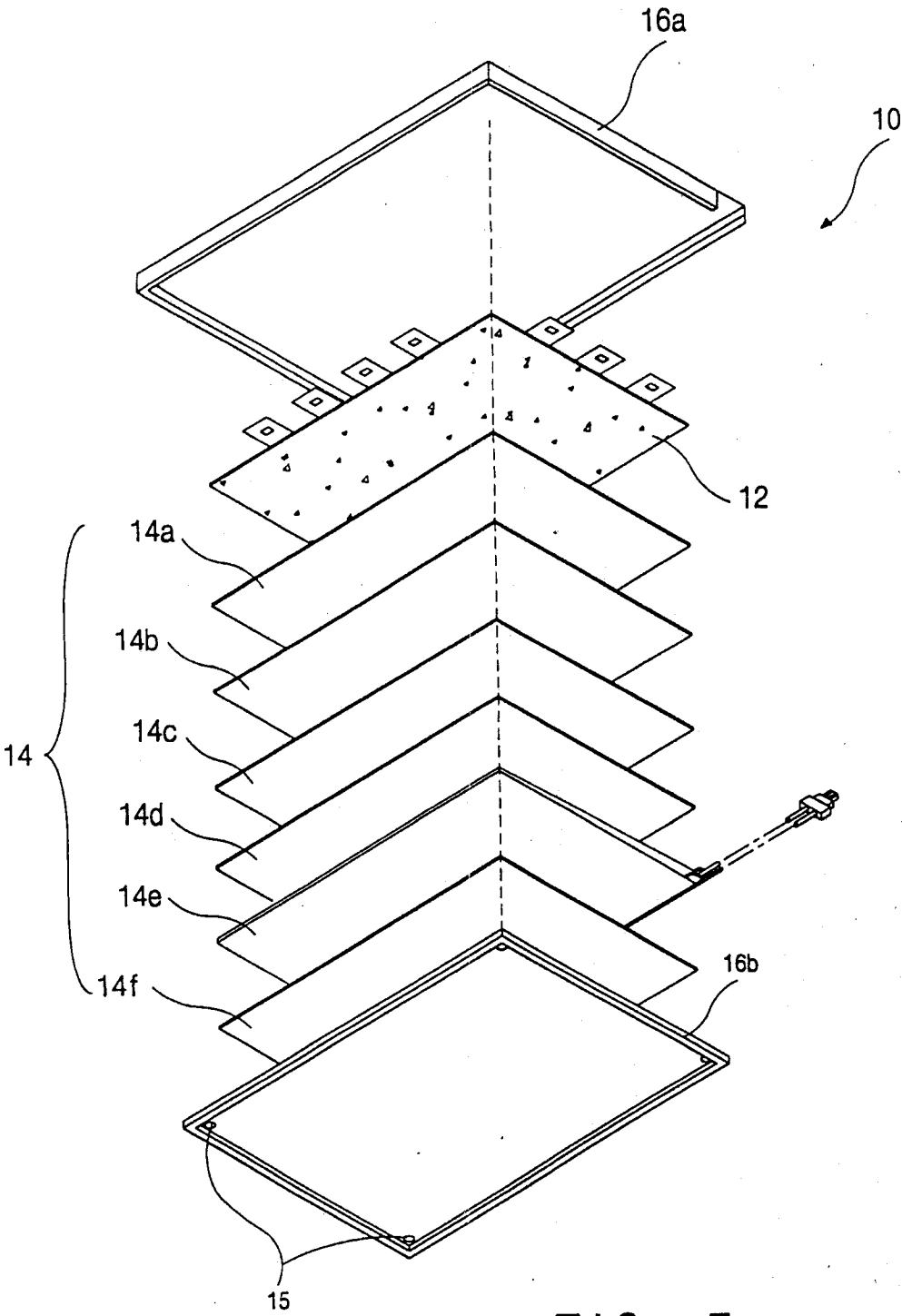


FIG. 5

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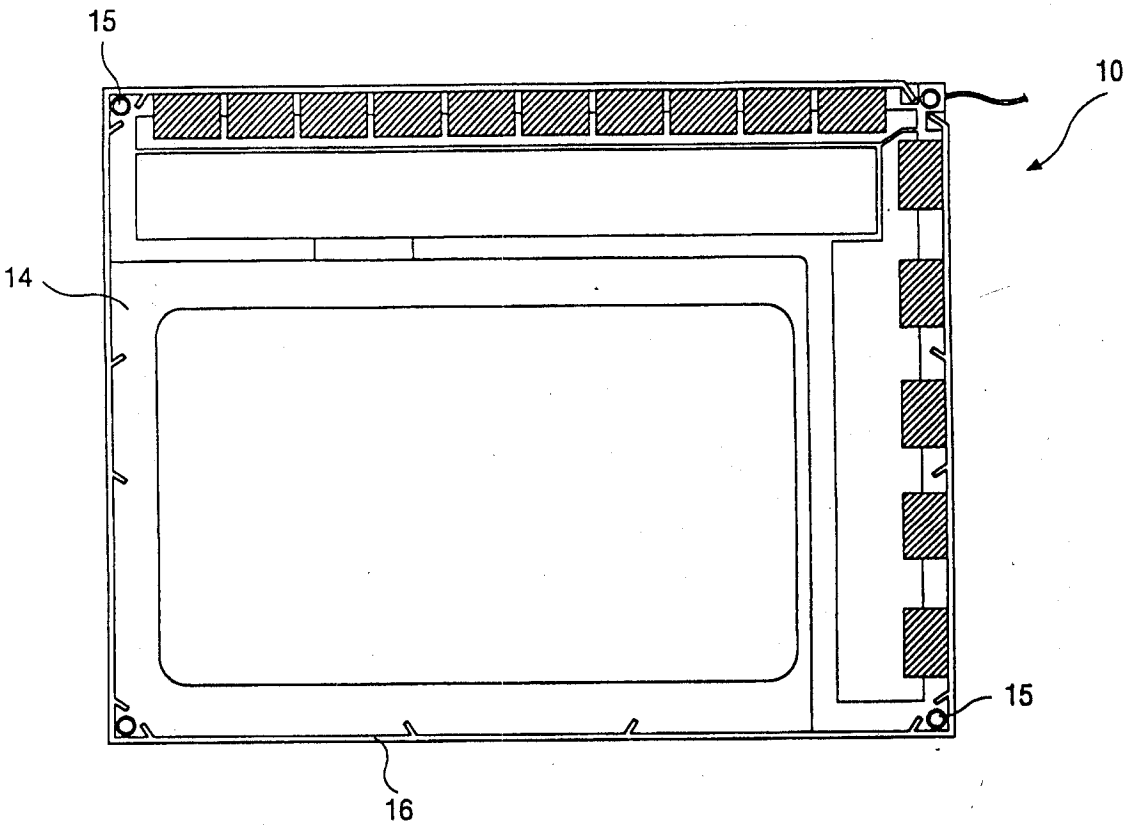


FIG. 6

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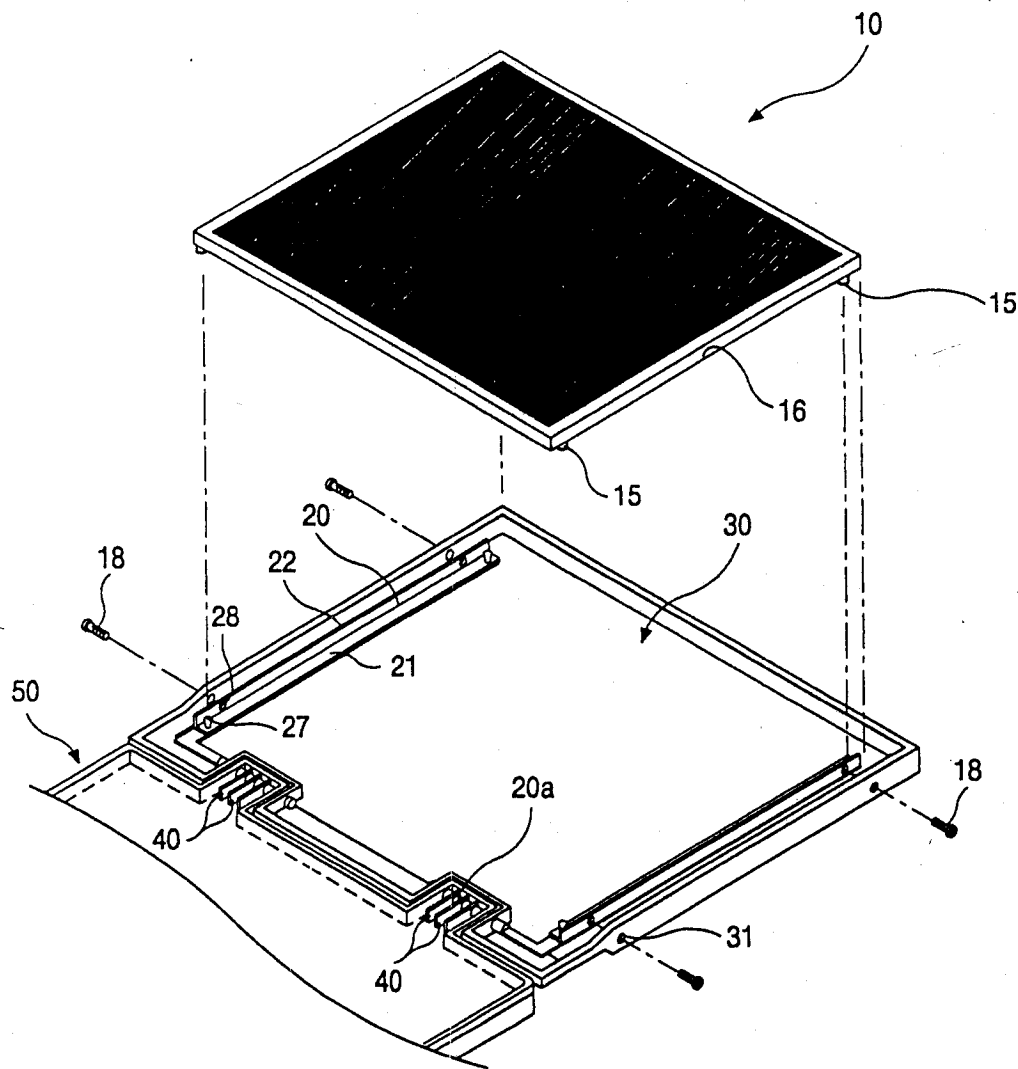


FIG. 7

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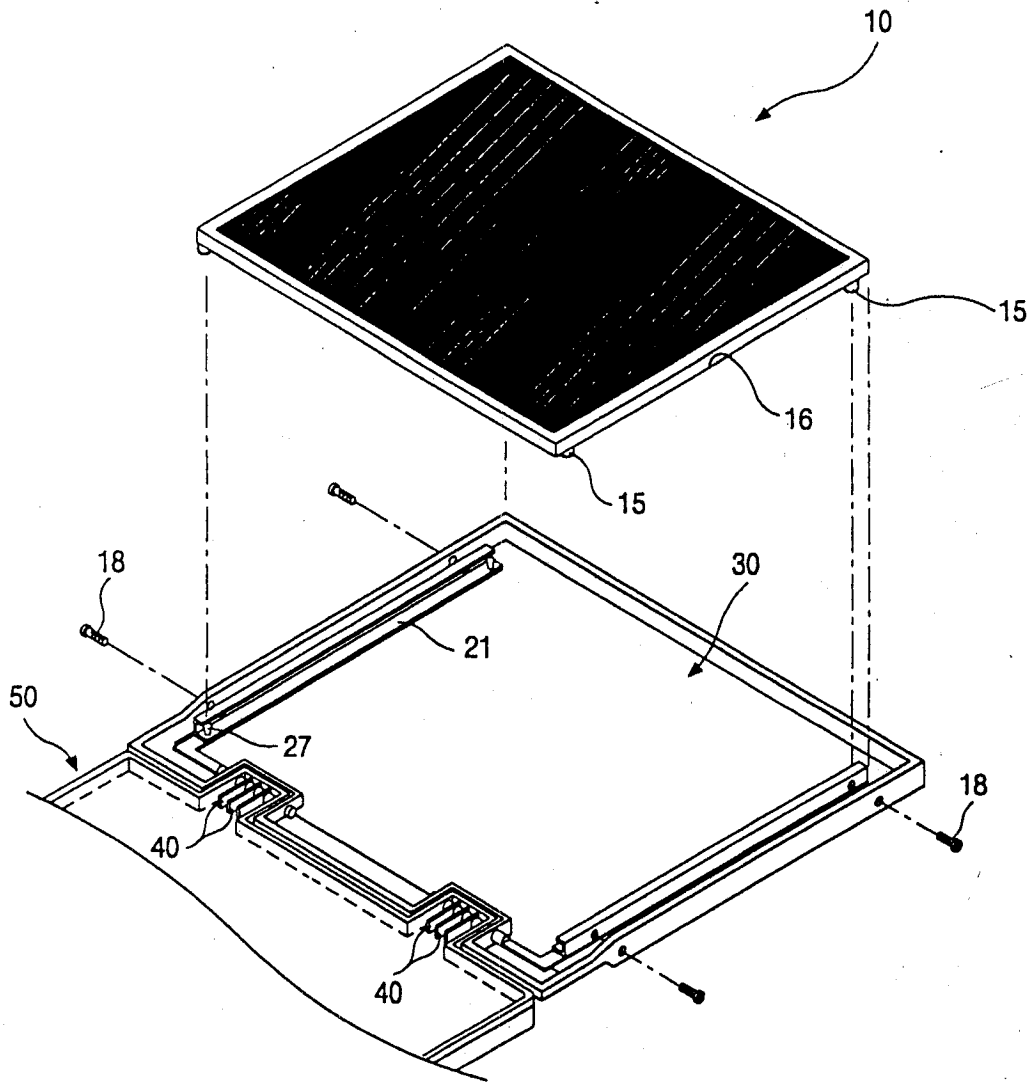


FIG. 8

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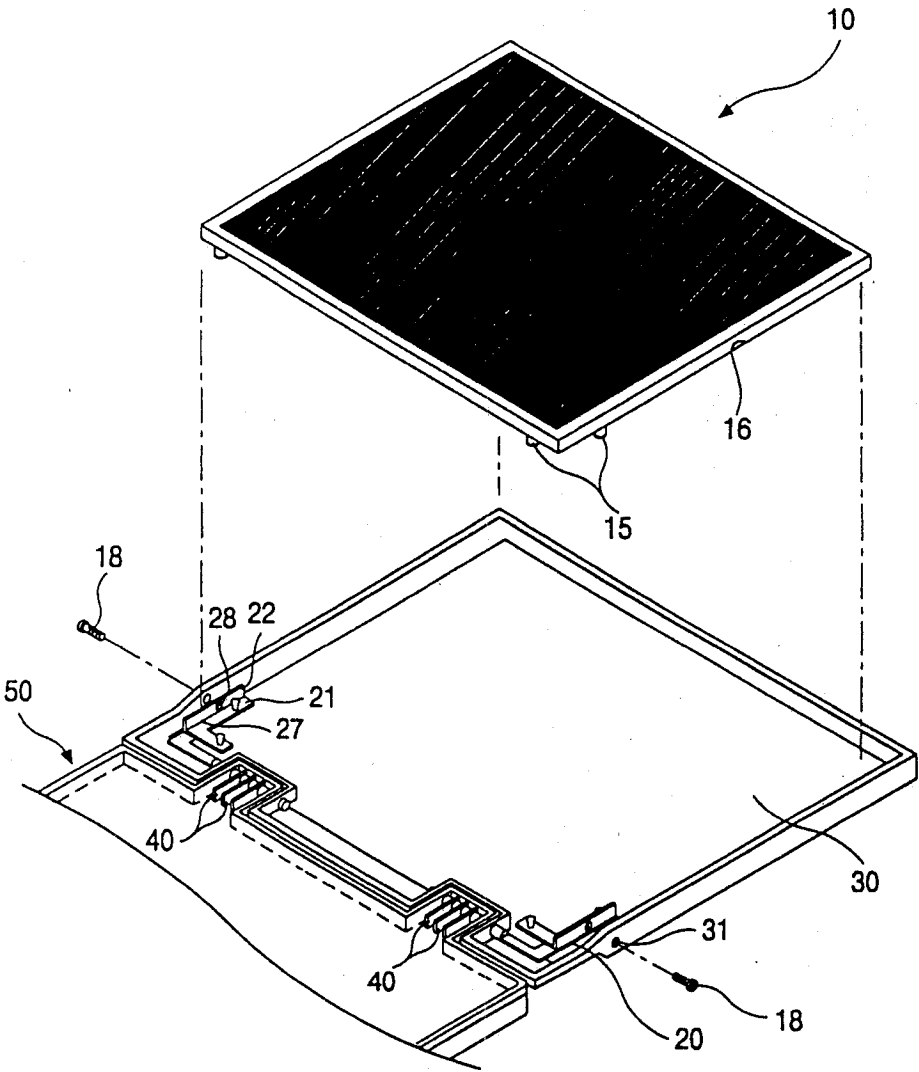


FIG. 9

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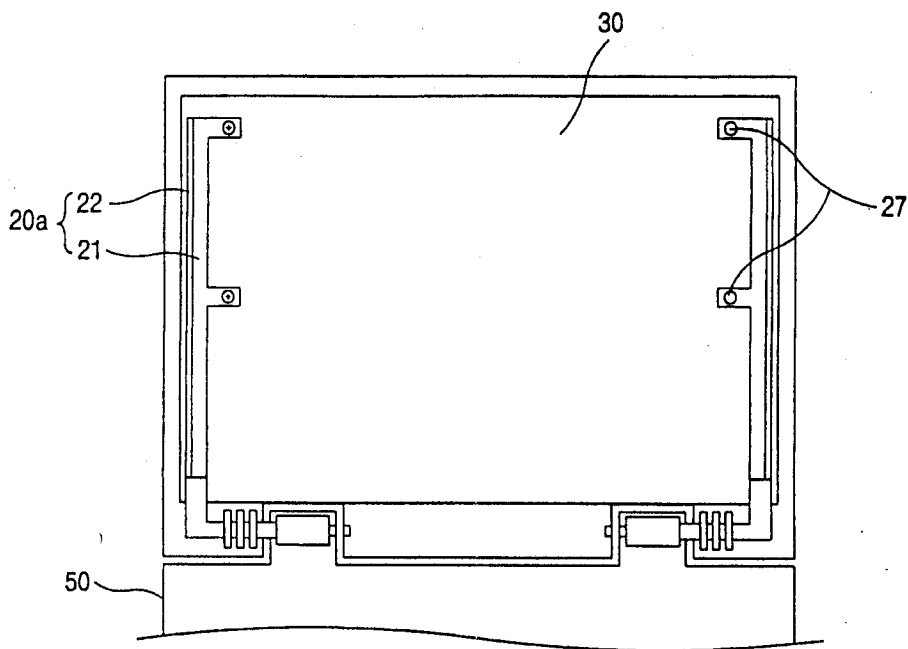


FIG. 10a

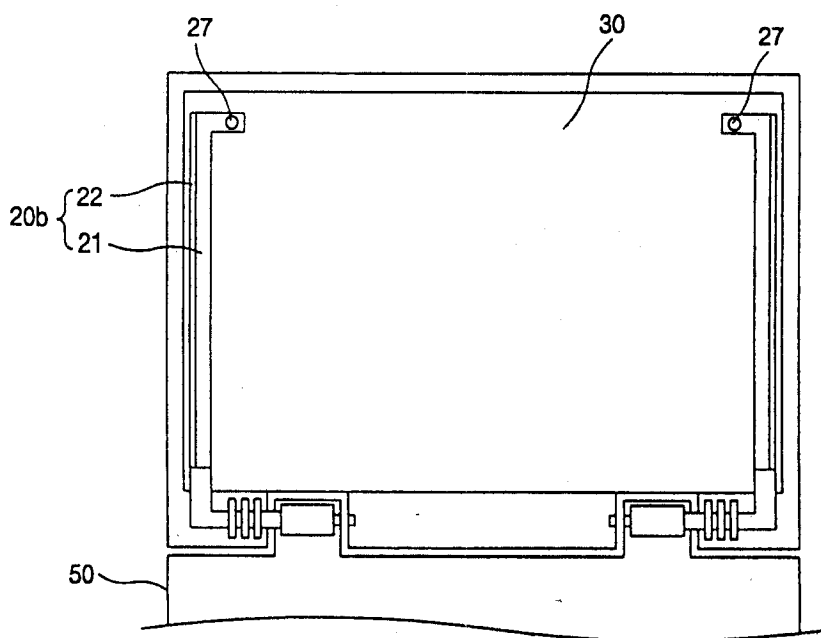


FIG. 10b

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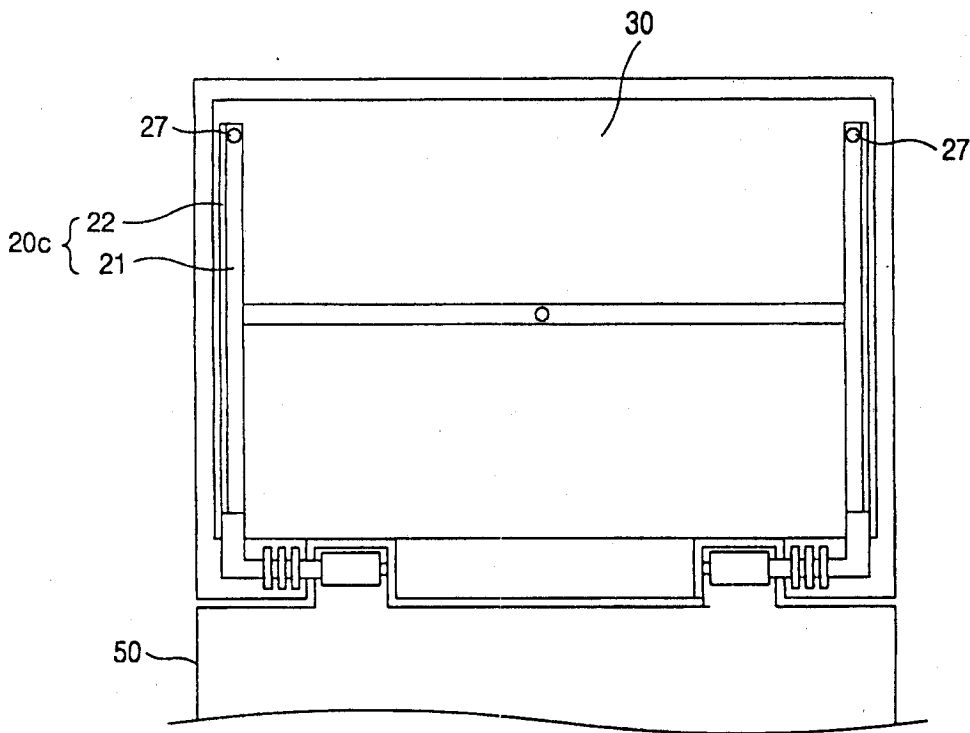


FIG. 10c

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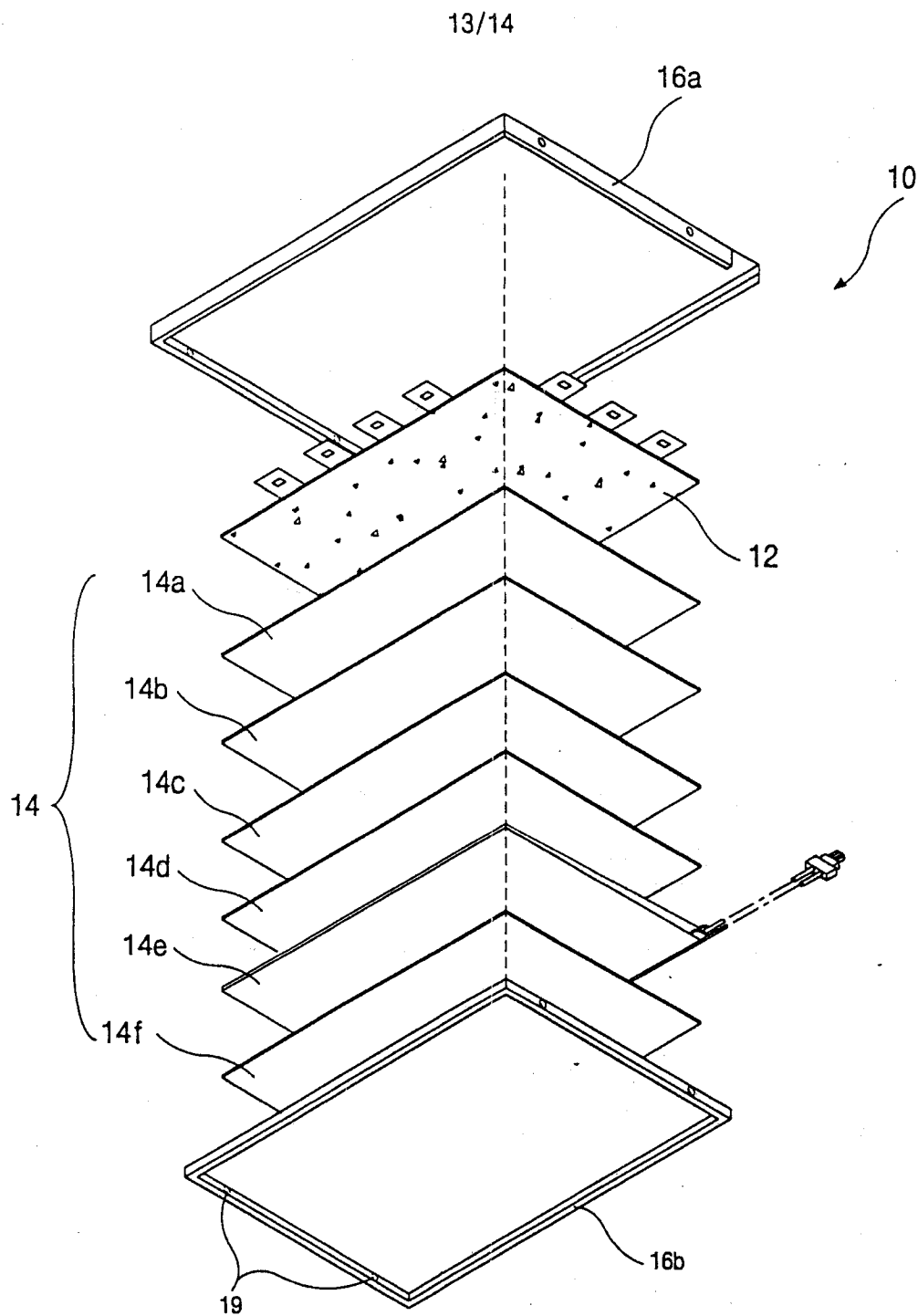


FIG. 11

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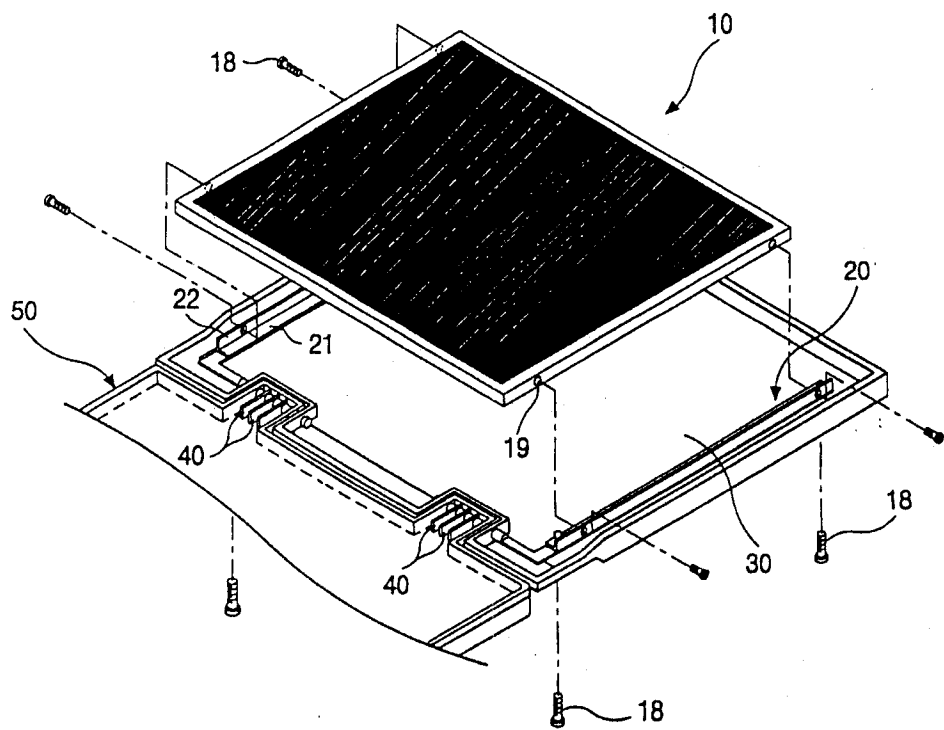


FIG. 12

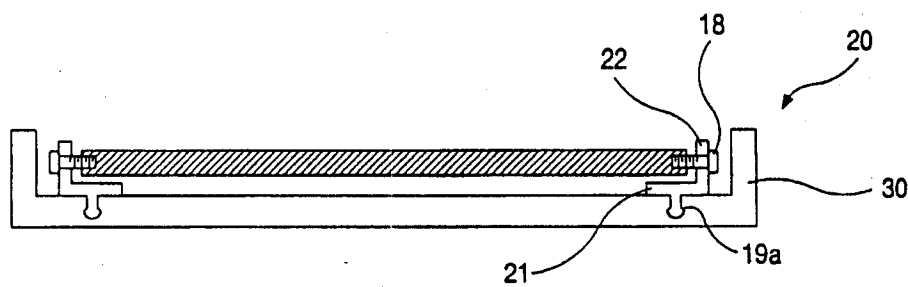


FIG. 13

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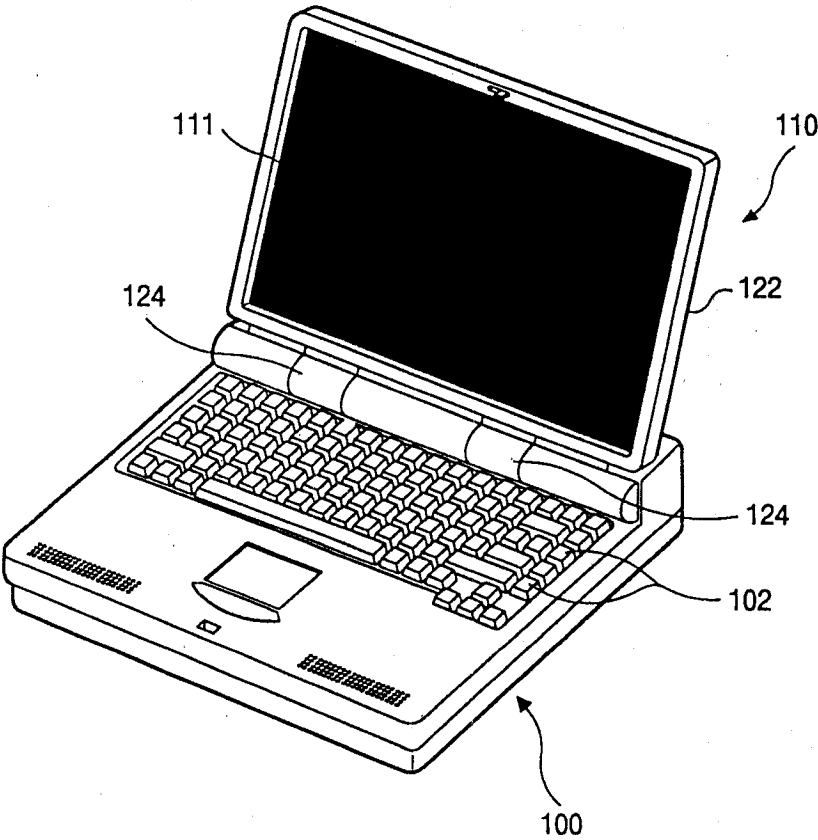


FIG. 1

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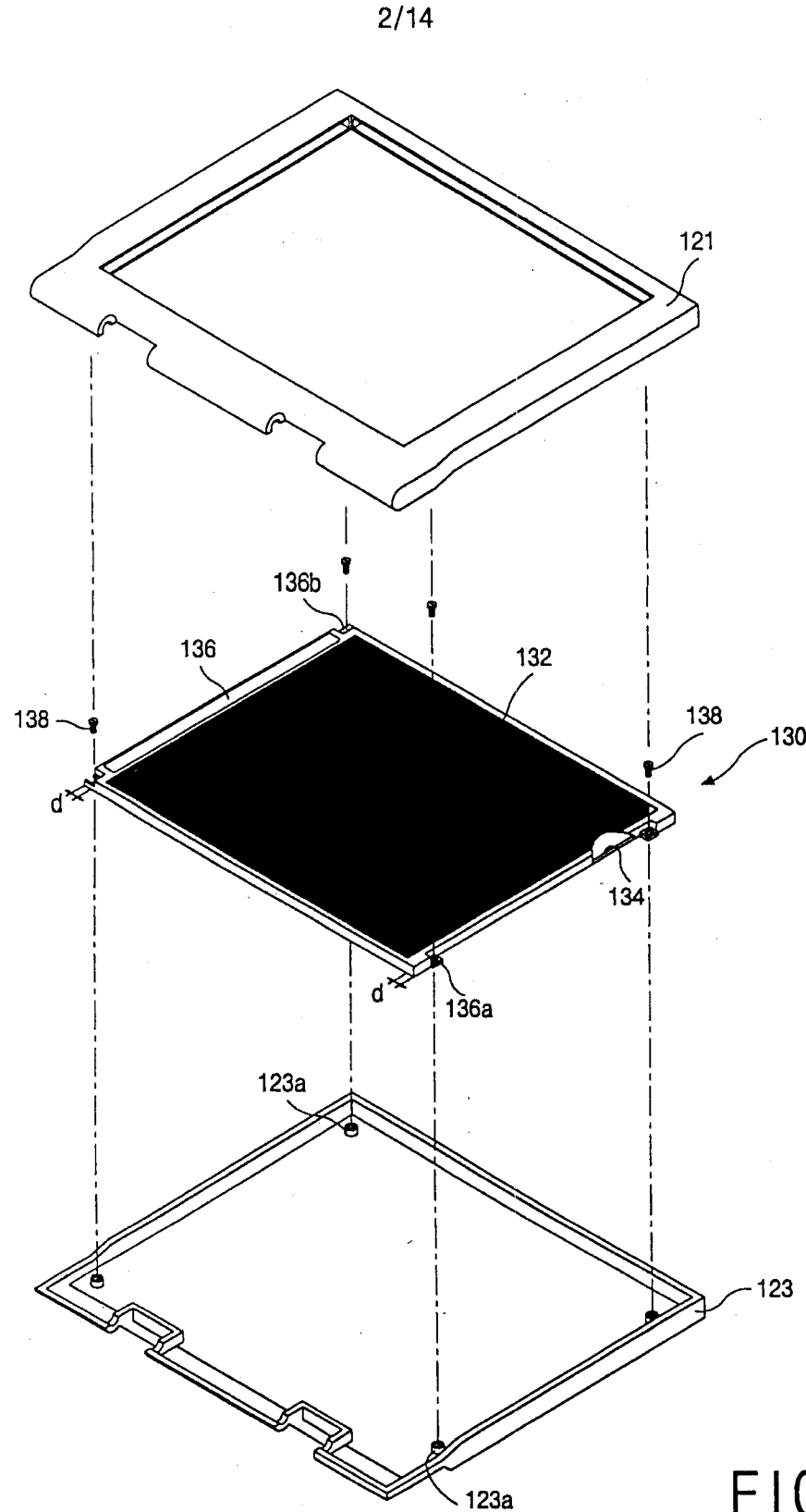


FIG. 2

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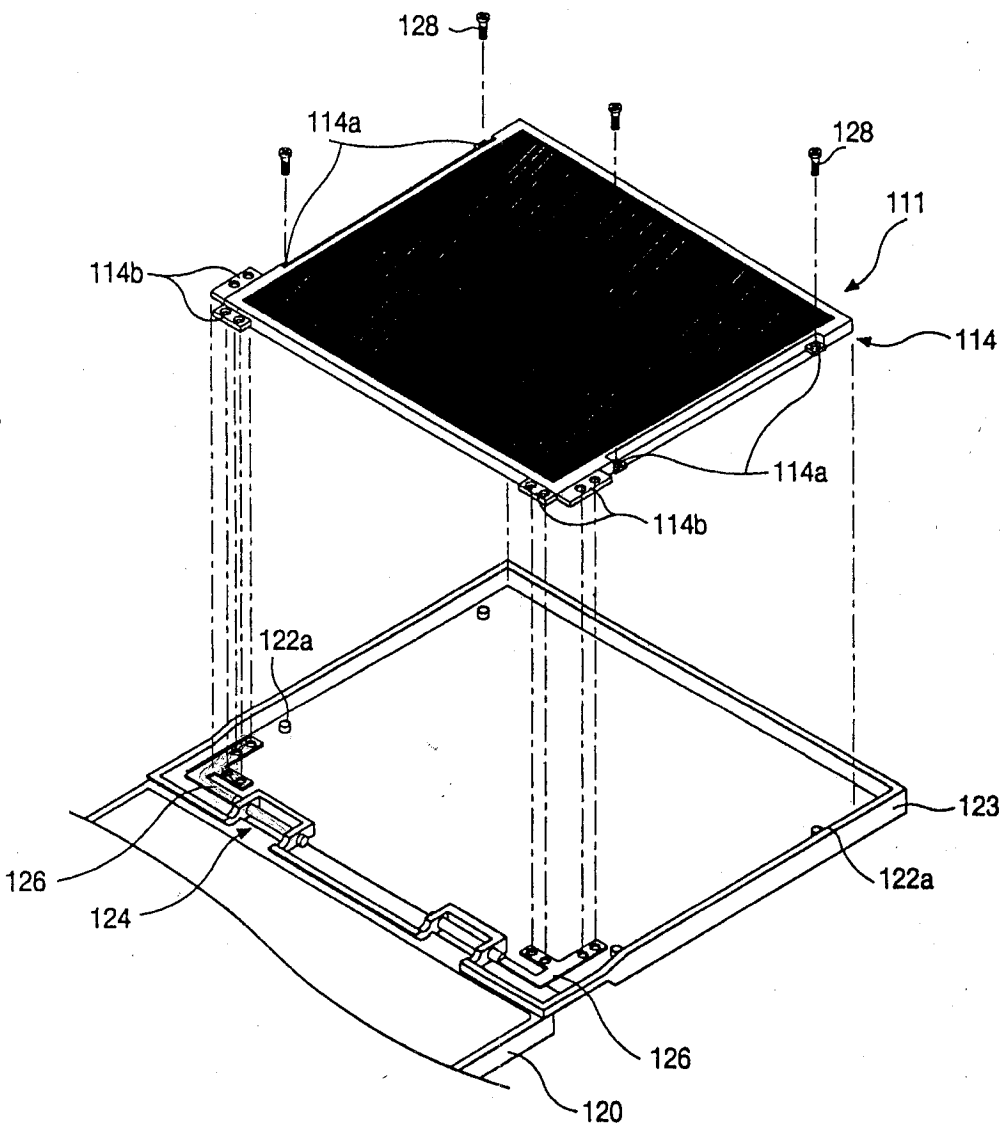


FIG. 3A

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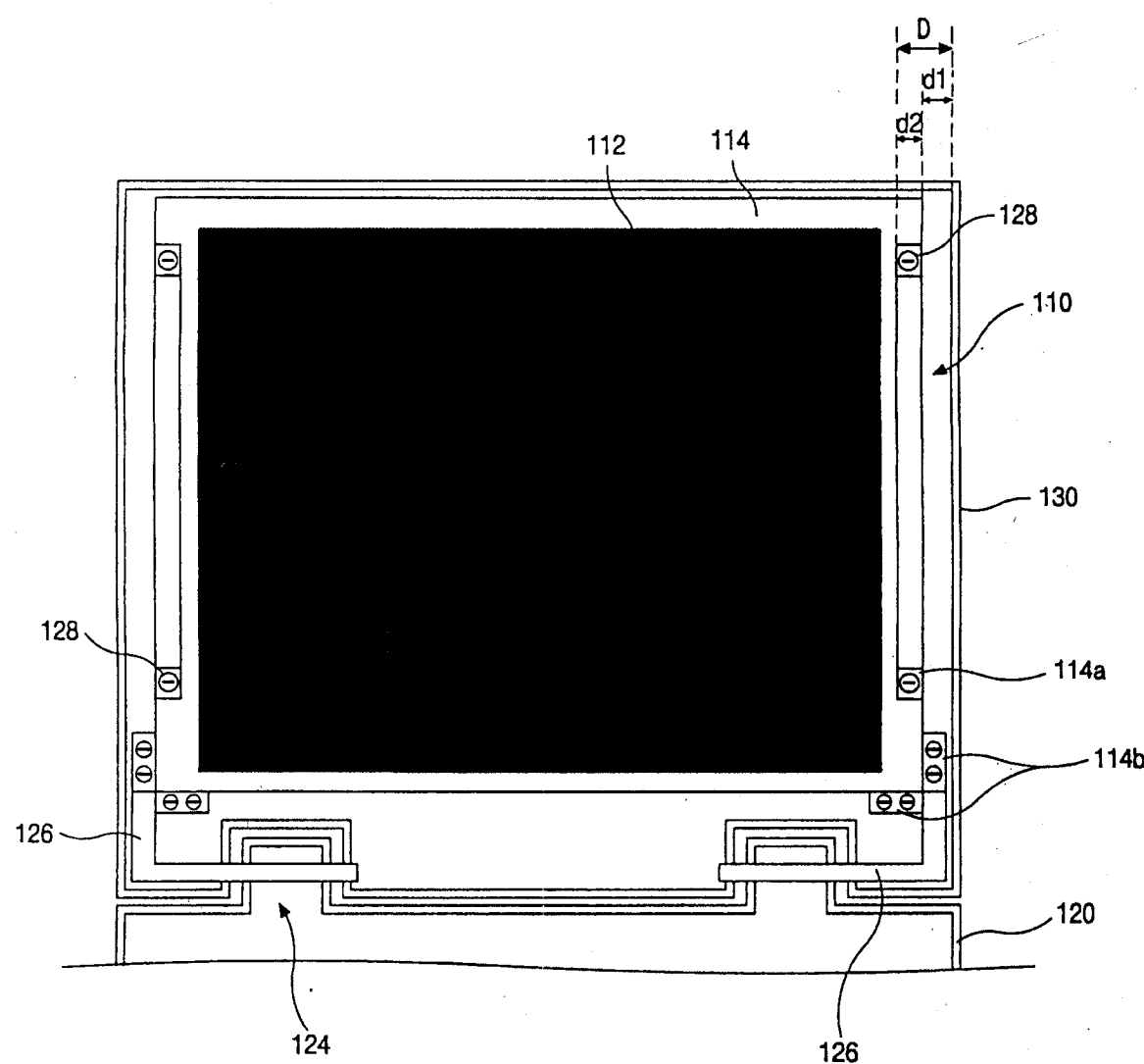


FIG. 3B

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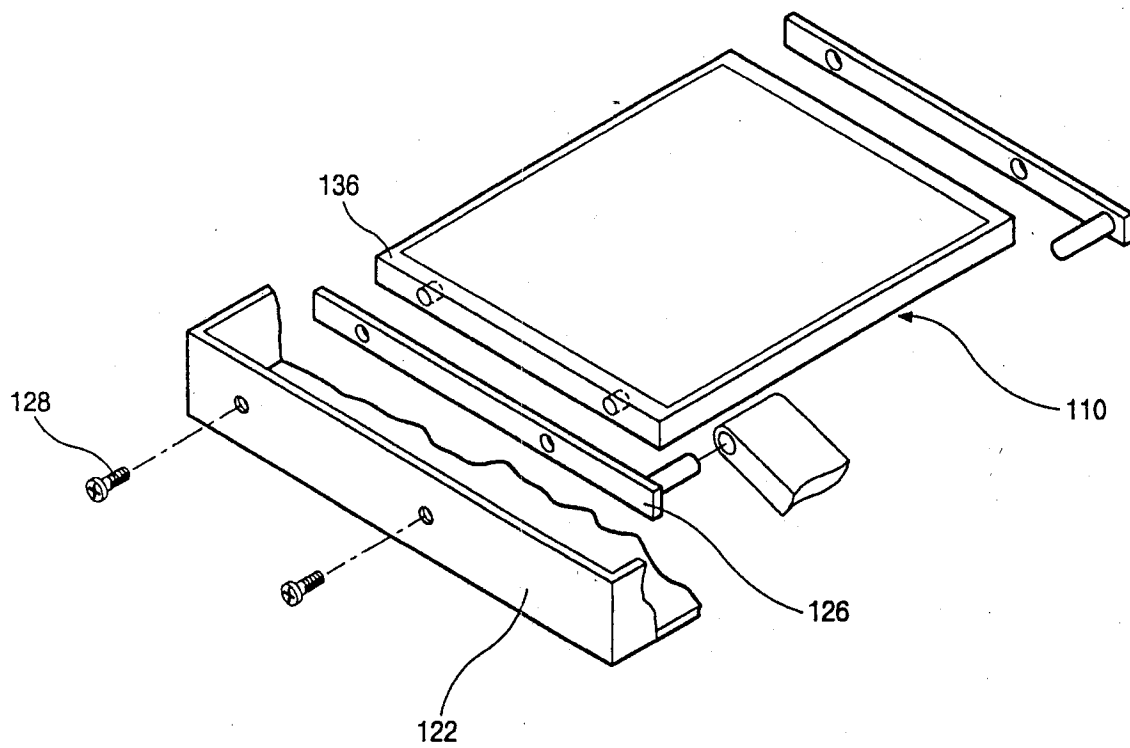


FIG. 4

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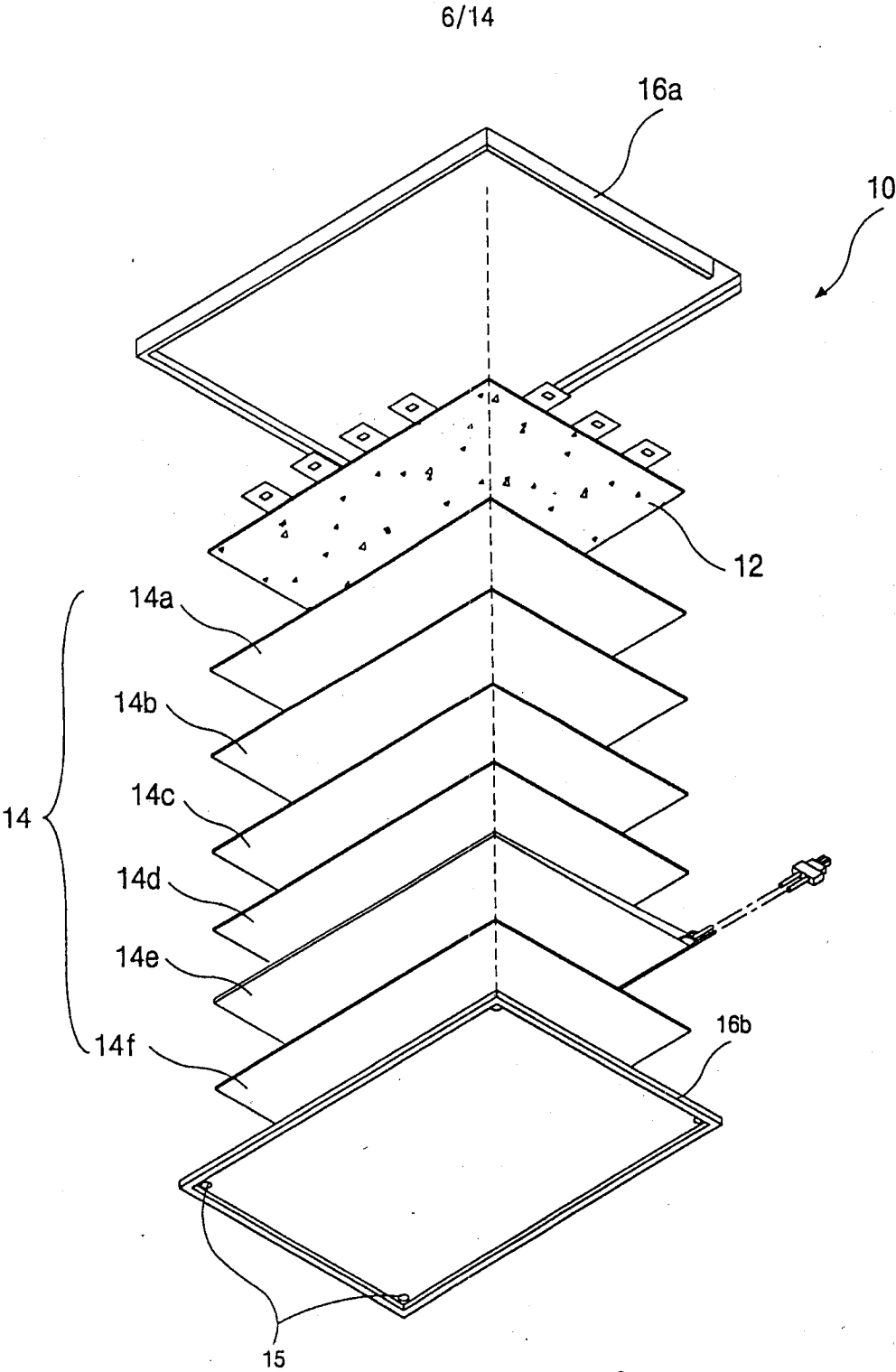


FIG. 5

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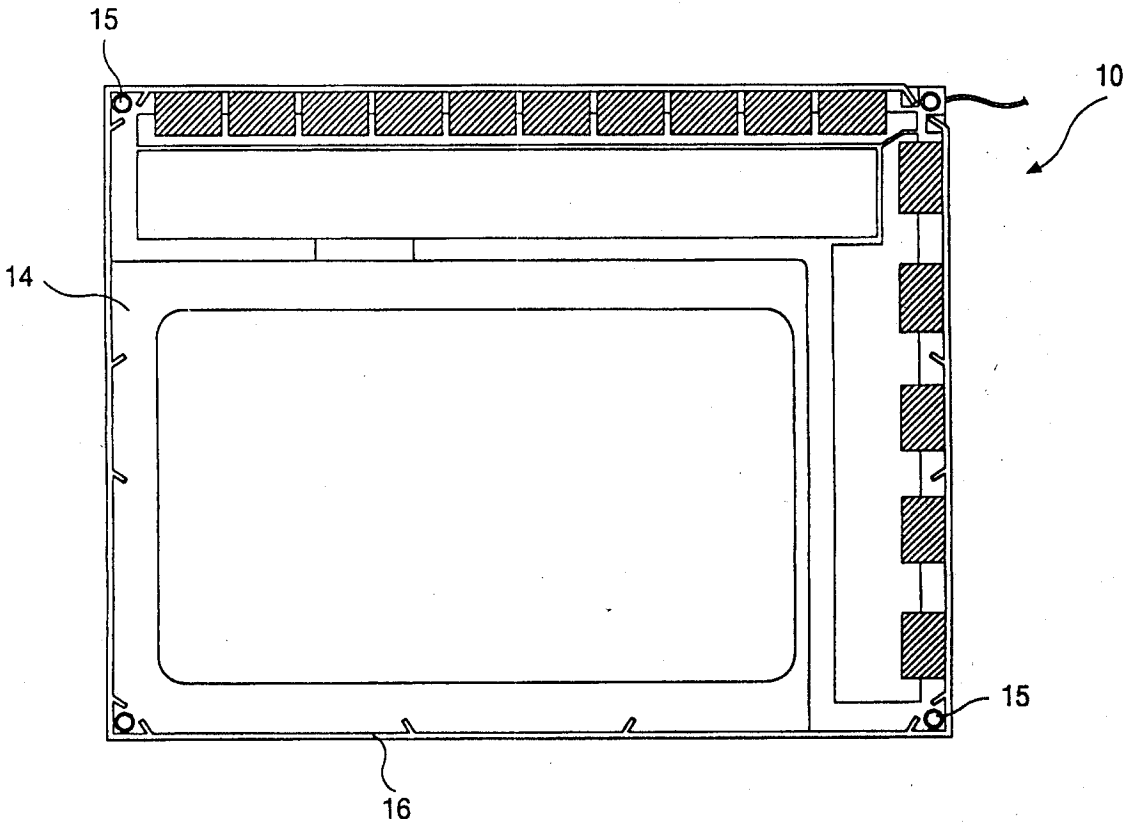


FIG. 6

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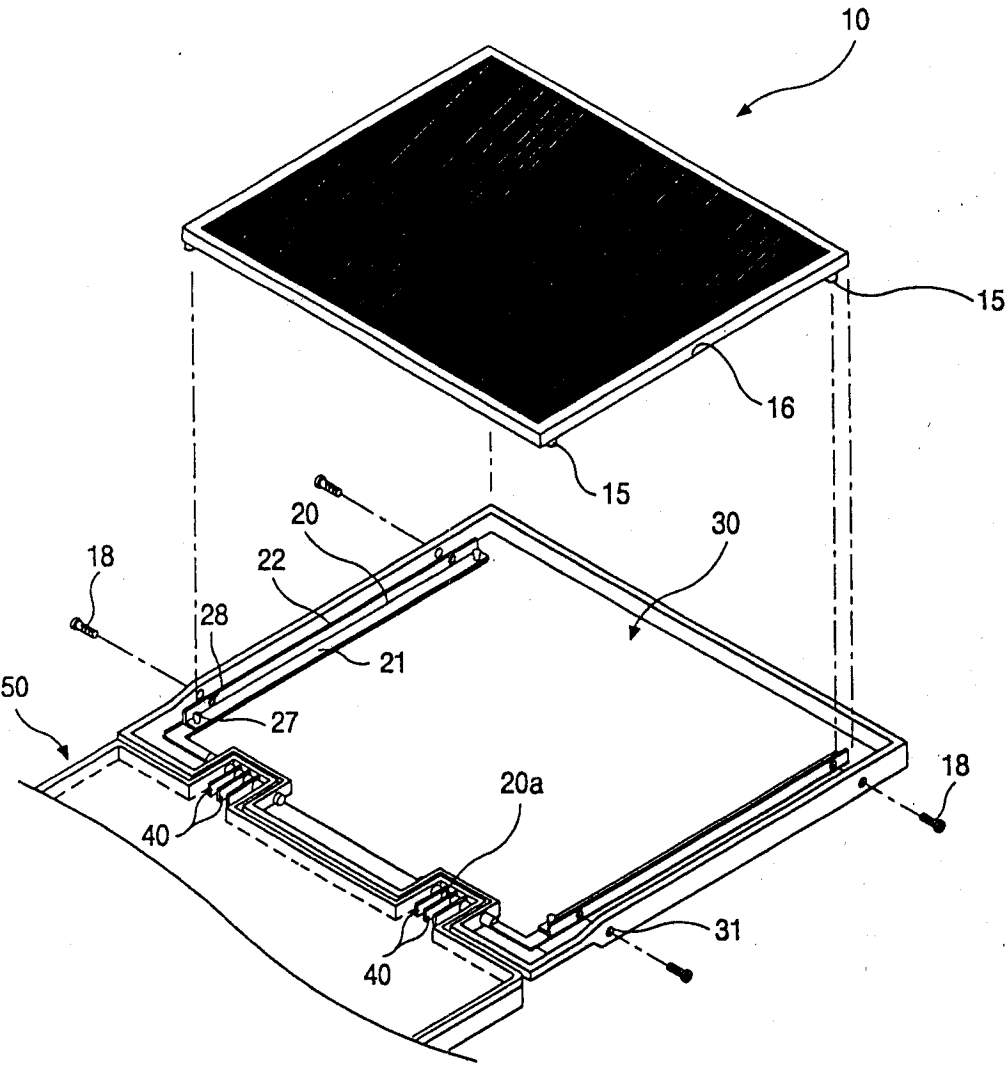


FIG. 7

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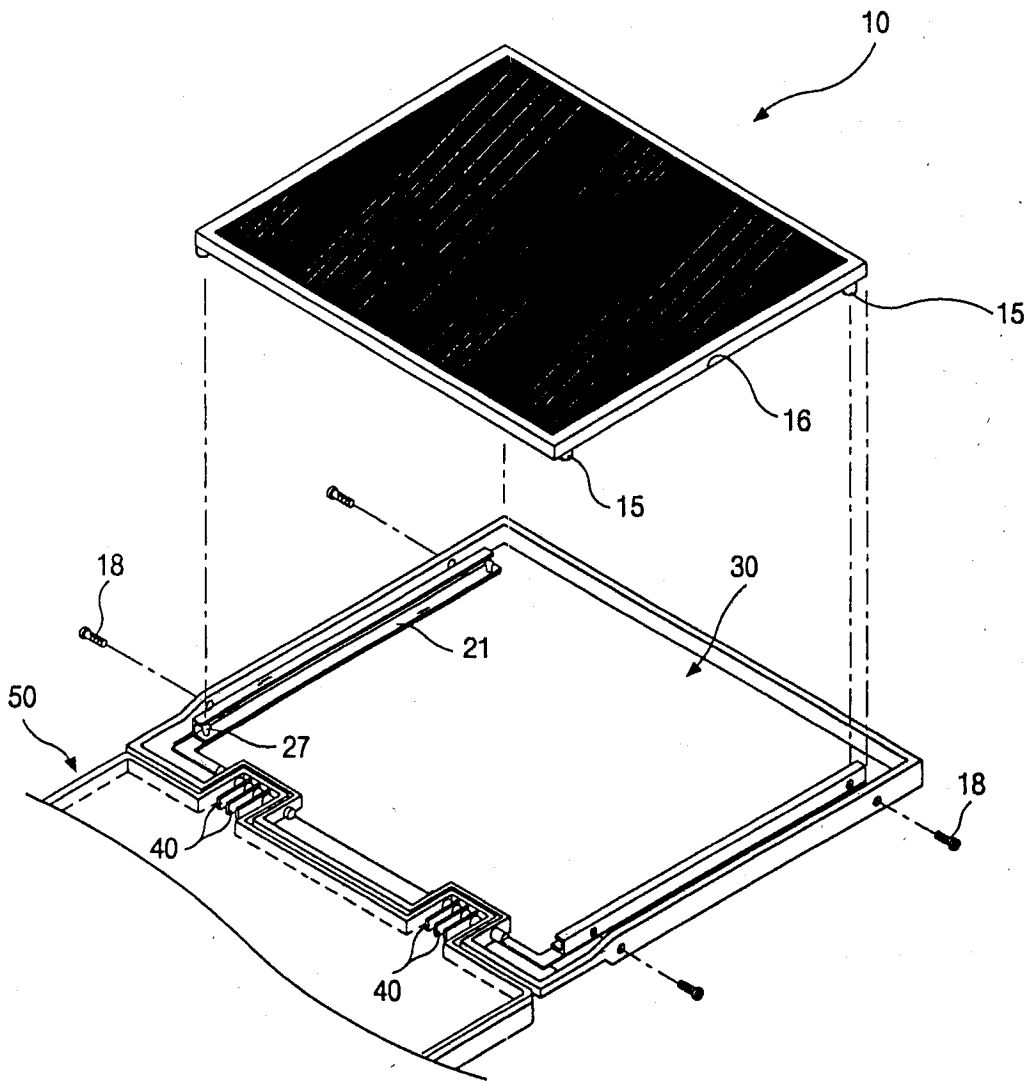


FIG. 8

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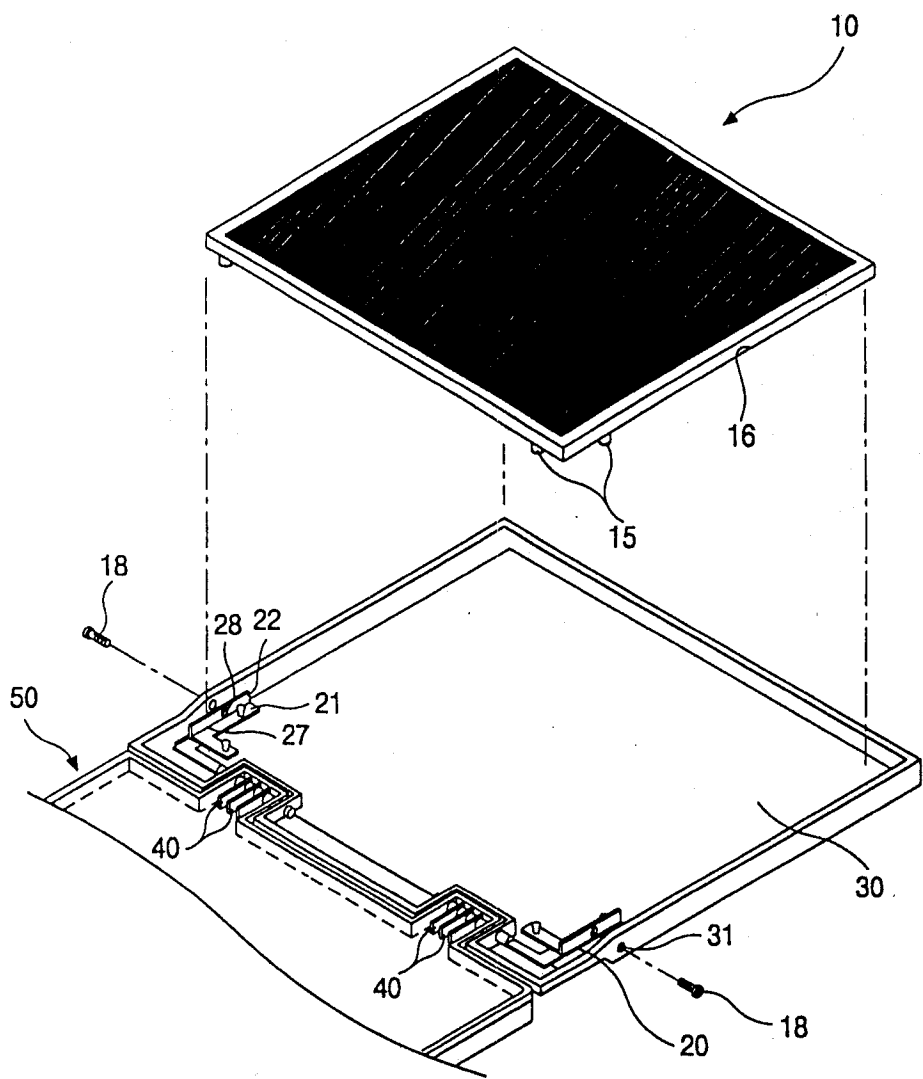


FIG. 9

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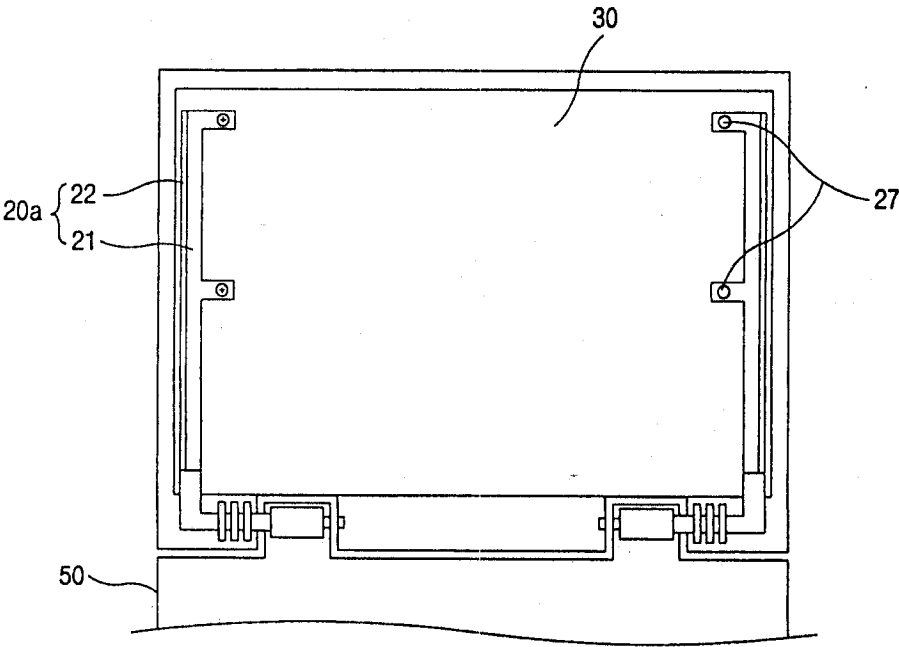


FIG. 10a

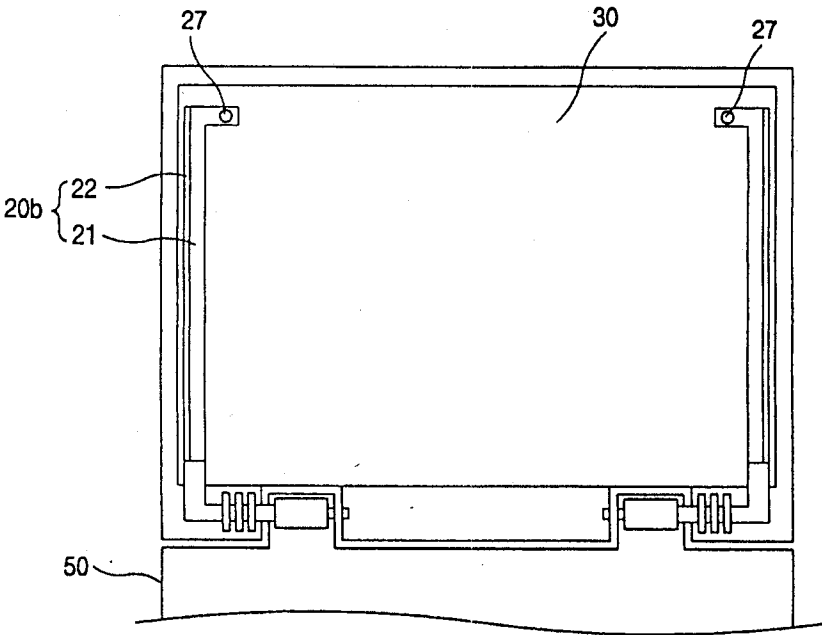


FIG. 10b

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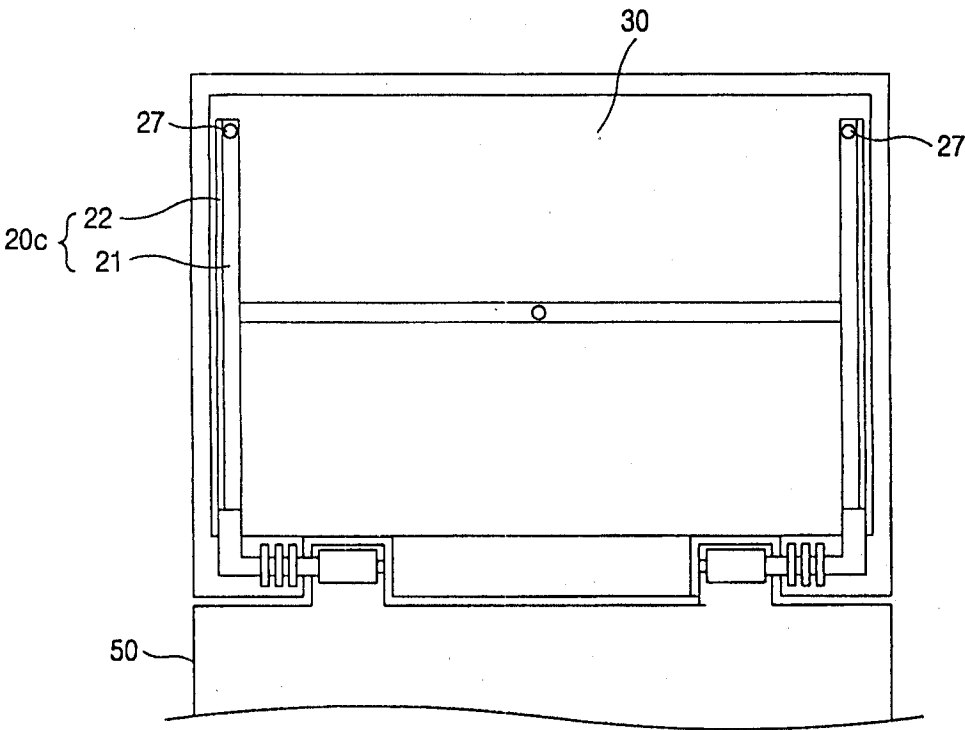


FIG. 10c

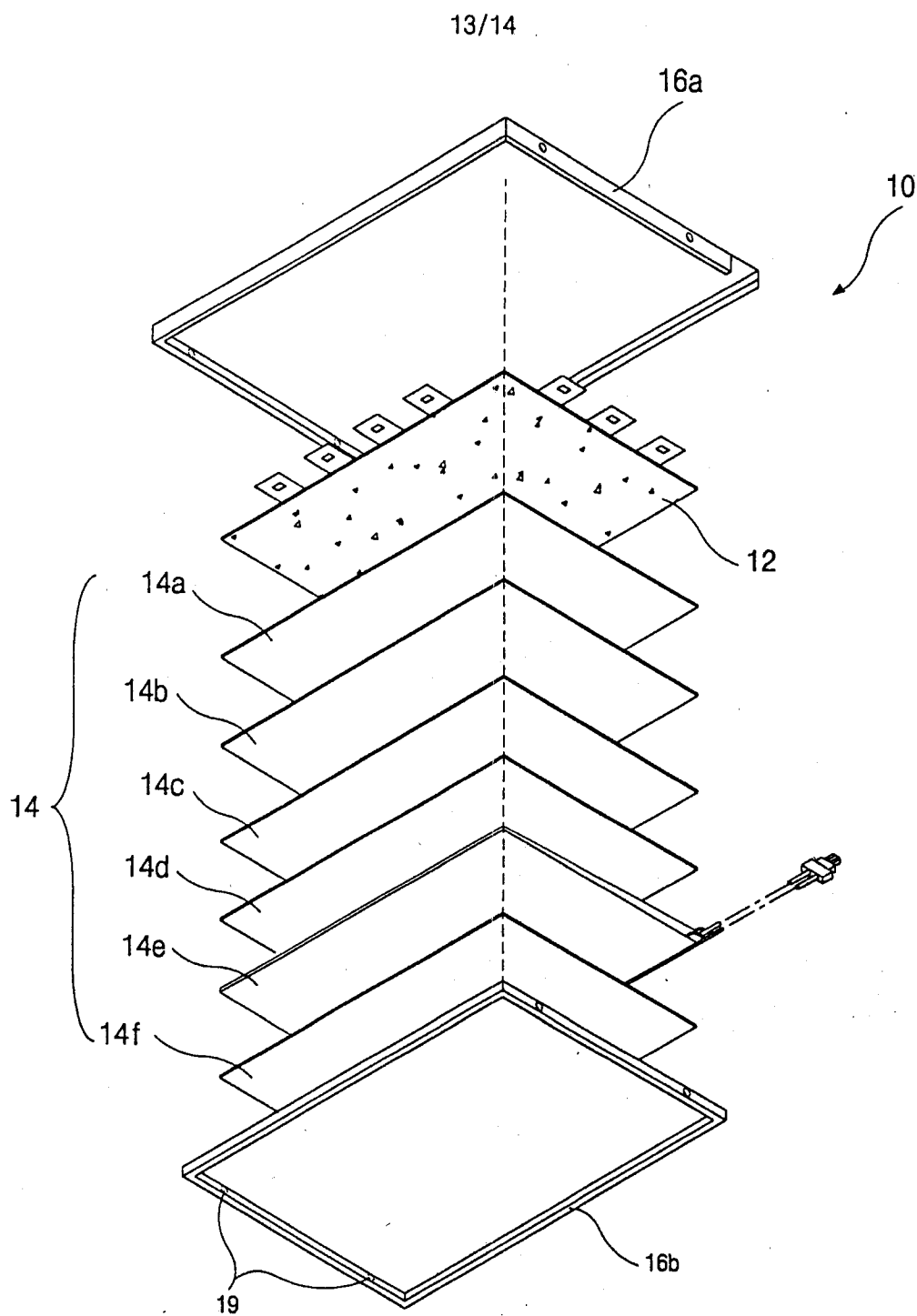


FIG. 11

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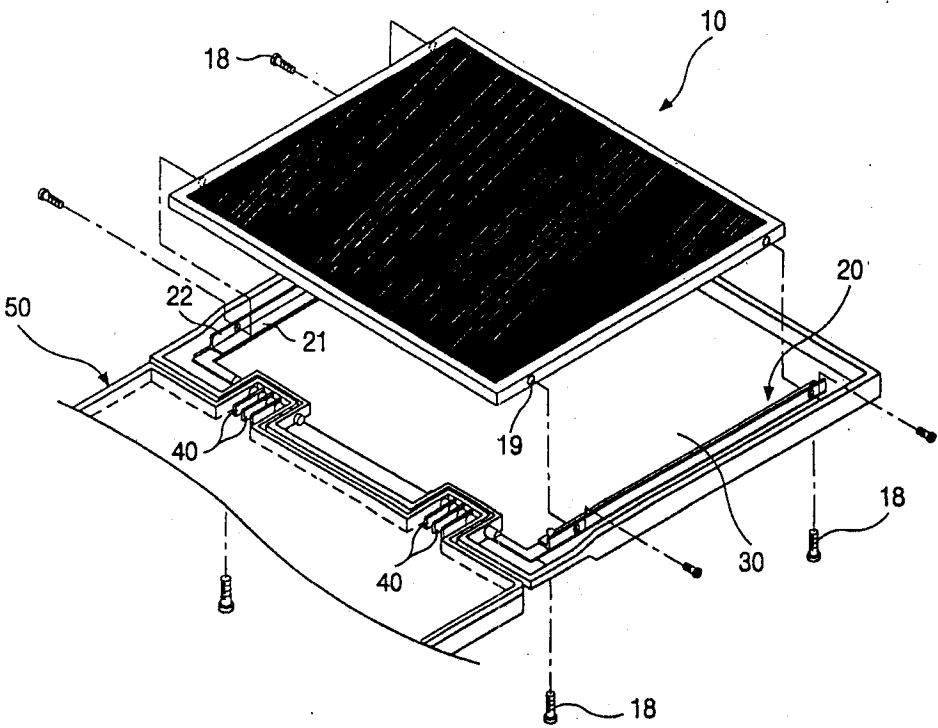


FIG. 12

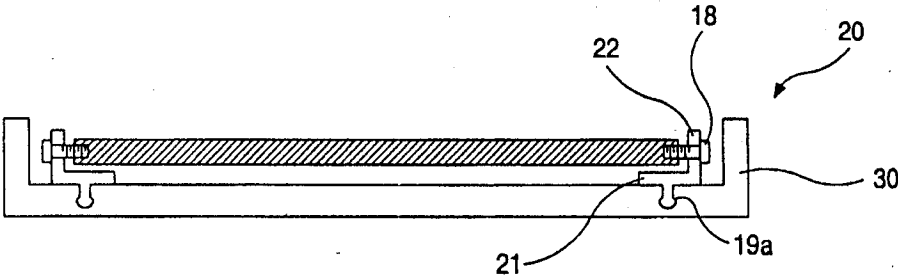


FIG. 13

Docket No. 8733.20067

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Young Woo CHO, et al.

GAU: TBA

SERIAL NO: To Be Assigned

EXAMINER: TBA

FILED: November 10, 1999

FOR: Portable Computer and Method for Mounting a Flat Panel Display Device Module

REQUEST FOR PRIORITY

JC542 U.S. PTO
09/437222
11/10/99

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

SIR:

- ☐ Full benefit of the filing date of U.S. Application Serial Number [US App No], filed [US App Dt], is claimed pursuant to the provisions of 35 U.S.C. §120.
- ☐ Full benefit of the filing date of U.S. Provisional Application Serial Number , filed , is claimed pursuant to the provisions of 35 U.S.C. §119(e).
- ☒ Applicants claim any right to priority from any earlier filed applications to which they may be entitled pursuant to the provisions of 35 U.S.C. §119, as noted below.

In the matter of the above-identified application for patent, notice is hereby given that the applicants claim as priority:

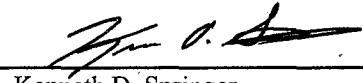
<u>COUNTRY</u>	<u>APPLICATION NUMBER</u>	<u>MONTH/DAY/YEAR</u>
KOREA	1998-48265	November 11, 1998

Certified copies of the corresponding Convention Application(s)

- ☐ are submitted herewith
- ☒ will be submitted prior to payment of the Final Fee
- ☐ were filed in prior application Serial No. filed
- ☐ were submitted to the International Bureau in PCT Application Number .
Receipt of the certified copies by the International Bureau in a timely manner under PCT Rule 17.1(a) has been acknowledged as evidenced by the attached PCT/IB/304.
- ☐ (A) Application Serial No.(s) were filed in prior application Serial No. filed ; and
(B) Application Serial No.(s)
- ☐ are submitted herewith
- ☐ will be submitted prior to payment of the Final Fee

Respectfully Submitted,

LONG ALDRIDGE & NORMAN LLP


Kenneth D. Springer
Registration No. 39,843

Date: November 10, 1999

Sixth Floor
701 Pennsylvania Avenue, N.W.
Washington, D.C. 20004
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Docket No. 8733.20067

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

INVENTOR(S) Young Woo CHO, et al.

SERIAL NO: To Be Assigned

FILING DATE: November 10, 1999

FOR: Portable Computer and Method for Mounting a Flat Panel Display Device Module

FEE TRANSMITTAL

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

FOR	NUMBER FILED	NUMBER EXTRA	RATE	CALCULATIONS
TOTAL CLAIMS	31 - 20 =	11	× \$18 =	\$198.00
INDEPENDENT CLAIMS	6 - 3 =	3	× \$78 =	\$234.00
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIMS (If applicable)			+ \$260 =	\$0.00
<input checked="" type="checkbox"/> LATE FILING OF DECLARATION			+ \$130 =	\$130.00
BASIC FEE				\$760.00
TOTAL OF ABOVE CALCULATIONS				\$1,322.00
<input type="checkbox"/> REDUCTION BY 50% FOR FILING BY SMALL ENTITY				\$0.00
<input type="checkbox"/> FILING IN NON-ENGLISH LANGUAGE			+ \$130 =	\$0.00
<input type="checkbox"/> RECORDATION OF ASSIGNMENT			+ \$40 =	\$0.00
TOTAL				\$1,322.00

- ☐ Please charge Deposit Account No. 50-0911 in the amount of
- A duplicate copy of this sheet is enclosed.
- ☒ A check in the amount of \$1,322.00 to cover the filing fee is enclosed.
- ☐ The Commissioner is hereby authorized to charge any additional fees which may be required for the papers being filed herewith and for which no check is enclosed herewith, or credit any overpayment to Deposit Account No. 50-0911.
A duplicate copy of this sheet is enclosed.

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11/10/99

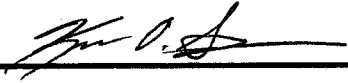
JC710 U.S. PTO

UTILITY PATENT APPLICATION TRANSMITTAL <small>For new nonprovisional applications under 37 CFR 1.53(b)</small>		Attorney Docket No. 8733.20067
First Inventor or Application Identifier Young Woo CHO		
Title	Portable Computer and Method for Mounting a Flat Panel Display Device Module	

11/10/99

JC542 U.S. PTO

APPLICATION ELEMENTS <i>See MPEP chapter 600 concerning utility patent application contents</i>	ADDRESS TO: Assistant Commissioner for Patents Box Patent Application Washington, DC 20231
<div>1. <input checked="" type="checkbox"/> Fee Transmittal Form (e.g. PTO/SB/17) <small>(Submit an original and a duplicate for fee processing)</small></div> <div>2. <input checked="" type="checkbox"/> Specification Total Pages 20</div> <div>3. <input type="checkbox"/> Drawing(s) (35 U.S.C. 113) Total Sheets 14</div> <div>4. <input type="checkbox"/> Oath or Declaration Total Pages <div>a. <input type="checkbox"/> Newly executed (original or copy)</div><div>b. <input checked="" type="checkbox"/> Copy from a prior application (37 C.F.R. §1.63(d)) <small>(for continuation/divisional with box 15 completed)</small><div>i. <input type="checkbox"/> DELETION OF INVENTOR(S) <small>Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §1.63(d)(2) and 1.33(b).</small></div></div></div> <div>5. <input type="checkbox"/> Incorporation By Reference <small>(usable if box 4B is checked)</small> <small>The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4B, is considered to be part of the disclosure of the accompanying application and is hereby incorporated by reference therein.</small></div>	ACCOMPANYING APPLICATION PARTS <div>6. <input type="checkbox"/> Assignment Papers (cover sheet & document(s))</div> <div>7. <input type="checkbox"/> 37 C.F.R. §3.73(b) Statement <input type="checkbox"/> Power of Attorney <small>(when there is an assignee)</small></div> <div>8. <input type="checkbox"/> English Translation Document <small>(if applicable)</small></div> <div>9. <input type="checkbox"/> Information Disclosure Statement (IDS)/PTO-1449 <input type="checkbox"/> Copies of IDS Citations</div> <div>10. <input type="checkbox"/> Preliminary Amendment</div> <div>11. <input checked="" type="checkbox"/> White Advance Serial No. Postcard</div> <div>12. <input type="checkbox"/> Small Entity Statement(s) <input type="checkbox"/> Statement filed in prior application. Status still proper and desired.</div> <div>13. <input type="checkbox"/> Certified Copy of Priority Document(s) <small>(if foreign priority is claimed)</small></div> <div>14. <input checked="" type="checkbox"/> Other: List of Inventors' Names and Addresses Request for Priority Check for \$1,322.00</div>
15. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below: <input type="checkbox"/> Continuation <input type="checkbox"/> Divisional <input type="checkbox"/> Continuation-in-part (CIP) of prior application no.: <div>Prior application information: Examiner: Group Art Unit:</div>	
16. Amend the specification by inserting before the first line the sentence: <input type="checkbox"/> This application is a <input type="checkbox"/> Continuation <input type="checkbox"/> Division <input type="checkbox"/> Continuation-in-part (CIP) of application Serial No. Filed on <input type="checkbox"/> This application claims priority of provisional application Serial No. Filed	
17. CORRESPONDENCE ADDRESS LONG ALDRIDGE & NORMAN LLP 701 Pennsylvania Avenue, N.W. Washington, D.C. 20004 (202) 624-1200 FACSIMILE: (202) 624-1298	

Name:	Kenneth D. Springer	Registration No.:	39,843
Signature:		Date:	November 10, 1999
Name:		Registration No.:	



UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. 20231
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Bib Data Sheet

CONFIRMATION NO. 7668

SERIAL NUMBER 09/437,222	FILING DATE 11/10/1999 RULE	CLASS 361	GROUP ART UNIT 2835	ATTORNEY DOCKET NO. 8733-20067	
APPLICANTS YOUNG WOO CHO, KYONGGI-DO, KOREA, REPUBLIC OF; JONG HWAN KIM, KYONGGI-DO, KOREA, REPUBLIC OF; DAE HEE PARK, KYONGGI-DO, KOREA, REPUBLIC OF; ** CONTINUING DATA ***** ** FOREIGN APPLICATIONS ***** REPUBLIC OF KOREA 1998-48265 11/11/1998 IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 12/08/1999					
Foreign Priority claimed <input type="checkbox"/> yes <input type="checkbox"/> no 35 USC 119 (a-d) conditions met <input type="checkbox"/> yes <input type="checkbox"/> no <input type="checkbox"/> Met after Allowance Verified and Acknowledged Examiner's Signature _____ Initials _____		STATE OR COUNTRY KOREA, REPUBLIC OF	SHEETS DRAWING 14	TOTAL CLAIMS 31	INDEPENDENT CLAIMS 6
ADDRESS LONG ALDRIDGE & NORMAN LLP 701 PENNSYLVANIA AVENUE N W WASHINGTON ,DC 20004					
TITLE PORTABLE COMPUTER AND METHOD FOR MOUNTING A FLAT DISPLAY DEVICE MODULE					
FILING FEE RECEIVED 1438	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		<input type="checkbox"/> All Fees <input type="checkbox"/> 1.16 Fees (Filing) <input type="checkbox"/> 1.17 Fees (Processing Ext. of time) <input type="checkbox"/> 1.18 Fees (Issue) <input type="checkbox"/> Other _____ <input type="checkbox"/> Credit _____		

8 13 18 23 28

PATENT APPLICATION FEE DETERMINATION RECORD

Effective November 10, 1998

Application or Docket Number

CLAIMS AS FILED - PART I

(Column 1)

(Column 2)

FOR	NUMBER FILED	NUMBER EXTRA
BASIC FEE		
TOTAL CLAIMS	31 minus 20= *	11
INDEPENDENT CLAIMS	6 minus 3 = *	3
MULTIPLE DEPENDENT CLAIM PRESENT		

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY
TYPE ☐OR OTHER THAN
SMALL ENTITY

RATE	FEE
	380.00
X\$ 9=	
X39=	
+130=	
TOTAL	

RATE	FEE
	760.00
X\$18=	198
X78=	230
+260=	
TOTAL	1192

CLAIMS AS AMENDED - PART II

(Column 1)

(Column 2)

(Column 3)

AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	*	Minus **	=
Independent	*	Minus ***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM			

SMALL ENTITY

OR OTHER THAN
SMALL ENTITY

RATE	ADDITIONAL FEE
X\$ 9=	
X39=	
+130=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
X\$18=	
X78=	
+260=	
TOTAL ADDIT. FEE	

(Column 1)

(Column 2)

(Column 3)

AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	* 33	Minus ** 33	= 2
Independent	* 7	Minus *** 7	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM			

RATE	ADDITIONAL FEE
X\$ 9=	2
X39=	
+130=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
X\$18=	
X78=	
+260=	
TOTAL ADDIT. FEE	

(Column 1)

(Column 2)

(Column 3)

AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total	* 31	Minus ** 33	=
Independent	* 6	Minus *** 7	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM			

RATE	ADDITIONAL FEE
X\$ 9=	
X39=	
+130=	
TOTAL ADDIT. FEE	

RATE	ADDITIONAL FEE
X\$18=	
X78=	
+260=	
TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.